COMMONWEALTH MYCOLOGICAL INSTITUTE
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The British Mycological Society

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TRANSACTIONS

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Volume VI

Edited by

CARLETON REA and J. RAMSBOTTOM

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THE SHREWSBURY FORAY.

24th-29th September, 1917.

The twenty-first annual week's fungus foray of the British Mycological Society was held at Shrewsbury, on Monday, the 24th of September, 1917. The members assembled at the headquarters The George Hotel, Market Street, Shrewsbury, where a room was reserved for the exclusive use of the Society. In the evening Miss E. M. Wakefield placed out on exhibition some eggs of a rare phalloid, which subsequently developed several handsome pilei; these were collected at Chiswick, on a heap of stable refuse, and were assigned by her to *Lysurus borealis* (Burt), P. Henn, but we should rather refer them to *Lysurus australiensis* Cke. and Massee, which is fully described, with plate, in our Transactions, Vol. II., 57, Pl. 3. The Very Rev. David Paul brought a large tuft of *Pleurotus sapidus* Kalchbr. from the Bishop's Palace at Wells, and also exhibited a fine photograph of *Clathrus ruber* (Micheli) Pers. (syn. *cancellatus*); these consisted of three specimens, two in the egg state and one fully developed, and were found by him at Kilmelford, Argyllshire, on the 10th of September. The Hon. Secretary reported that their past President, Mr. E. W. Swanton, had informed him that Miss Phœbe Keef about the same date gathered this rare phalloid in a wood near Sea View, Isle of Wight. Mr. James Menzies sent on some nice specimens of *Melastiza miniata* (Fuck.) Boud., gathered by Mr. Charles McIntosh at Dunkeld, and Mr. A. A. Pearson brought from Wimbledon a specimen that he referred to *Galera antipus* (Lasch) Fr.

On Tuesday, the 25th of September, the members assembled at the railway station and booked by the 10.5 a.m. train to Plowden, via the Craven Arms. On their arrival there at 11.35 they were met by Mr. R. Parry, who had most kindly offered to conduct them through the Plowden woods and had obtained permission to visit this estate from Captain Plowden. Mr. Parry first led them down to the bridge over the river Onny and then a traverse across the fields was made in the direction of Plowden Hall. The pastures yielded many specimens the most noteworthy including *Tricholoma brevipes* (Bull.) Fr., *Eccilia griseorubella*

(Lasch) Fr., *Marasmius urens* (Bull.) Fr., *Pleurotus corticatus* Fr. on elm, *Geoglossum ophioglossoides* (Linn.) Sacc., (syn. *glabrum*), *Cortinarius* (*Hydrocybe*) *dolabratus* Fr., *Pholiota squarrosa* (Müll.) Fr., on walnut, *Hygrophorus obrusseus* Fr., and *Clavaria fumosa* (Pers.) Fr. After luncheon the walk was continued through the woods in the direction of the road to Bishop's Castle, and the following fungi were gathered on the way : *Lepiota fulvella* Rea (new to science)*, *Boletus porphyrosporus* Fr., *Mycena pelianthina* Fr., *Lactarius obnubilus* (Lasch) Boud., *Marasmius fuscopurpureus* (Pers.) Fr., *Hygrophorus pudorinus* Fr., *Marasmius porreus* (Pers.) Fr., *Clavaria pistillaris* (Linn.) Fr., *Clavaria stricta* (Pers.) Fr., *Cortinarius* (*Telamonia*) *impennis* Fr. and *Collybia xanthopus* Fr. Miss Wakefield subsequently reported the finding of *Polyporus stipticus* (Pers.) Fr., which is an addition to the British list. It was past four o'clock when the highway was reached and over two miles of this had to be traversed before they could rejoin the other members who had accompanied the President and Mr. Parry to Walcot Park. Here they were most hospitably entertained to tea by the Earl and Countess of Powis and great regret was expressed that time did not allow for the investigation of the Walcot woods. The return train was taken from Plowden station at 5.55 p.m., and at Horderley Miss Lister rejoined the party having after luncheon, accompanied Messrs. W. B. Allen and W. N. Cheesman in a walk through the woods bordering the Onny valley. They made the following additions to the list :—*Lepiota Friesii* (Lasch) Fr., *Hygrophorus olivaceo-albus* Fr., *Cortinarius* (*Hydrocybe*) *saturninus* Fr., *Thelephora anthocephala* (Bull.) Fr., *Thelephora spiculosa* Fr., *Microglossum viride* (Pers.) Gill., *Cortinarius* (*Telamonia*) *psammocephalus* Fr., and *Lactarius pallidus* (Pers.) Fr. In the evening, at nine o'clock, the President (Miss A. Lorrain Smith F.L.S.) took the chair, and the following officers were unanimously elected for the ensuing year :—The Very Rev. David Paul, LL.D., D.D., President; Miss Gulielma Lister, F.L.S., Vice-President; and Mr. Carleton Rea, B.C.L., M.A., &c., Hon. Secretary and Treasurer. Selby was selected as the centre for the autumn foray of 1918 and Mr. W. Norwood Cheesman, F.L.S. very kindly undertook to arrange the details for the meeting; the date to be fixed subsequently by the Hon. Secretary after consultation with the President elect and Mr. Cheesman. Miss A. Lorrain Smith, F.L.S., was appointed

*See description (p. 61).

delegate to represent the British Mycological Society at the Conference of Delegates of Corresponding Societies of the British Association in 1918. The Hon. Treasurer reported that they now numbered one hundred and forty four members and had enrolled ten new members since the New Forest foray, viz:—Mr. F. Arnold, M.A., Holmdene, 56, Cathedral Road, Cardiff; Mr. William Bellerby, 8, Burton-stone Lane, York; Miss Elsie M. Blackwell, M.Sc., Botanical Laboratories, The University, Liverpool; Miss H. Clarke, M.Sc., Botanical Laboratories, The University, Liverpool; Mr. E. Ernest Green, F.Z.S., F.E.S., Way's End, Camberley, Surrey; Mrs. Annis Ellis, 13, Stoney Hey Road, New Brighton, Cheshire; Mr. James Menzies, 24, King Edward Street, Perth; Mr. J. F. Rayner, Swaythling, Southampton; Miss Mary R. H. Thomson, Cape Town; and Mr. H. J. Wheldon, 147, c Cottage, Holbrook Lane, Coventry. The credit balance at the post office saving's bank shewed a balance of twenty one pounds and eight shillings in their favour which contrasted favourably with the accounts as exhibited in their programme which showed no balance at all. The forty five pounds received from the bequest of the late Mrs. E. M. Robinson had with the accruing income been invested in fifty pounds War Loan. Mrs. A. Ellis had given the Society her late husband's copies of Saccardo's Sylloge Fungorum, vol. III, Sphaeropsideae et Melanconiae; Plowright's British Uredineae and Ustilagineae; and Tubeuf's and Smith's Diseases of plants induced by cryptogamic parasites: these would be available to the members who applied for them. A hearty vote of thanks was accorded to her for the kind gifts. Professor S. H. Vines had suggested that the Society should publish a paper on fungicides, and the Hon. Secretary reported that Mr. A. D. Cotton, F.L.S.,* had consented to do so and his action was approved.

On Wednesday, the 26th of September, the morning was devoted to placing out on exhibition the more uncommon fungi collected on the previous day, as the size of the room did not permit of the usual full display. Mr. Norman G. Hadden sent from the neighbourhood of Porlock, *Hydnum graveolens* (Delast.) Fr., *Geaster fimbriatus* (Vitt.) Fr., *Marasmius pruinatus* Rea, *Uromyces Loti* Blytt, on *Lotus corniculatus, Uromyces sparsus* Lév. on *Spergularia salina,* and *Uromyces Salicorniae* de Bary. At noon the members drove from the headquarters to Haughmond Abbey, where

*Pressure of war work has prevented Mr Cotton supplying us with this paper.

the woods in the immediate vicinity of the picturesque ruins were explored. Here some nice examples of *Cyphella galeata* (Schum.) Fr., *Lactarius circellatus* Fr., *Lactarius obnubilus* (Lasch) Boud. and *Mycena amicta* Fr. were collected. The roadway was then crossed and a prettily wooded bank traversed in the direction of Uffington. The ground, beneath numerous fine beeches growing amidst short grass and moss, yielded an abundant harvest of the common fungi but the rarer sorts were few and included *Pholiota adiposa* Fr., *Polyporus intybaceus Fr., Pleurotus corticatus* Fr., *Marasmius globularis* (Weinm.) Fr., *Russula atropurpurea* (Krombh.) Maire, *Fomes resinaceus* (Boud.) Rea and *Amanita recutita* Fr. On reaching the village of Uffington the return drive was taken to Shrewsbury. In the evening, at nine o'clock, Miss A. Lorrain Smith, F.L.S. delivered her presidential address entitled "Relation of Fungus Hyphae to other Organisms" (see p. 17).

On Thursday, the 27th of September, the members assembled at the railway station and departed by the 11.20 a.m. train for Buildwas Junction which was reached about mid-day. Mr. W. B. Allen met the members and led them across the pastures in the direction of Tickwood. The grass was somewhat long but specimens of *Trichoglossum hirsutum* (Pers.) Boud., *Clitopilus cretatus* B. & Br. and *Cortinarius* (*Hydrocybe*) *bicolor Cke.* were noticed on the way. The woods at Tickwood were then worked by kind permission of Col. G. G. P. Heywood, and under the able leadership of Mr. Allen, who is a native of these parts and intimately acquainted with this covert, they were conducted to the most favoured spots for the rarer fungi. The undergrowth was very rank but notwithstanding this drawback the following interesting plants were obtained :—*Naucoria escharoides* Fr., *Collybia vertirugis Cke., Helvella lacunosa* Afz., *Amanita strobiliformis* Vitt., *Cortinarius* (*Phlegmacium*) *scaurus* Fr., *Entoloma Bloxamii* Berk., *Amanita solitaria* (Bull.) Fr., *Lactarius scrobiculatus* (Scop.) Fr., *Hygrophorus sciophanus* Fr., *Cortinarius* (*Telamonia*) *stemmatus* Fr., *Armillaria ramentacea* (Bull.) Fr., *Inocybe incarnata* Bres., *Leptopodia ephippium* (Lév.) Boud., *Cortinarius* (*Dermocybe*) *cotoneus* Fr., *Marasmius foetidus* (Sow.) Fr., *Cortinarius* (*Phlegmacium*) *calochrous* (Pers.) Fr., *Boletus impolitus* Fr., *Polyporus stipticus* (Pers.) Fr., and *Lycoperdon velatum* Vitt. Tickwood Hall was reached about 4.30 p.m. and Mrs. G. P. P. Heywood welcomed the members to a dainty tea, which was much appreciated. The light began to fail and a rather hurried walk across the fields

brought the members to the Buildwas station in time to catch the last train back to Shrewsbury at 6.39 p.m. In the evening the President took the chair at nine o'clock Mr. W. Norwood Cheesman, J.P., F.L.S. read a paper on "The British Tremellineae" and Miss E. W. Wakefield, F.L.S., followed with "Observations on some Sand-Dune Fungi" (see p. 33).

On Friday, the 28th of September, the morning was occupied in the critical examination of the rarer fungi. These included *Strobilomyces strobilaceus* (Scop.), Berk., and *Boletus felleus* (Bull.) Fr., gathered by Miss C. Cooper and Miss K. Smith in Lythe Wood, near Shrewsbury, on the previous day. At 11.15 a.m. the 'bus was taken from the adjoining square to Bayston Hill, from whence a short walk across the fields brought them to Bomere. The members spread out in all directions through the woods surrounding this pool, but the woods were too overgrown and dry with the exception of the lower portions adjoining the water, which yielded an abundant crop of mycetozoa. A few additions were made to the list, namely, *Aleuria ampliata* (Pers.) Gill., *Tubaria paludosa* Fr., *Hydnum ferrugineum* Fr., *Psilocybe uda* (Pers.) Fr., *Inocybe calospora* Quél., and *Russula integra* (Linn.) Fr. A large patch of *Lactarius vellereus* Fr. was covered with the parasitic mould *Amblyosporium botrytis* Fres. The members returned to the headquarters about six o'clock.

In the evening, at 9 o'clock, Miss A. Lorrain Smith took the chair, and Mr. A. A. Pearson read a paper on "Two-spored basidia" (see p. 39). A hearty vote of thanks was passed to the Earl of Powis, Col. G. G. P. Heywood, Capt. Plowden, and Mrs. Hugh Corbet, for the kind permissions given to visit their estates, and to the two former for their kind hospitality. A similar vote was also passed to Mr. R. Parry and Mr. W. B. Allen for their able leadership in the field, and especially to the latter for the selection of places to visit during the foray. On Saturday, the 29th of September, some of the members availed themselves of Mr. Allen's kind offer to conduct them through Caughley Wood, adjacent to Linley Station, on the Severn Valley line. Many scarce fungi were collected, including *Lepiota hispida* (Lasch) Fr., *Lepiota pratensis* (Bull.) Fr., *Lepiota rosea* Rea (new to science),* *Lepiota haematosperma* (Bull.) Boud., *Lepiota sistrata* Fr., *Lepiota Bucknallii* B. & Br., *Pluteus salicinus* (Pers.) Fr., *Omphalia atropuncta* (Pers.) Quél., *Polystictus Wynnei* B. and Br., *Clavaria chionea* (Pers.) Quél. (new to Britain), *Clavaria rugosa* (Bull.) Fr., var.

*See description (p. 61).

fuliginea Fr., *Clavaria cinerea* (Bull.) Fr., var. *gracilis* Rea (n. var.)† and *Poria vitrea* (Pers.) Fr. A fine circle of *Psaliota elvensis* B. & Br. was found by Mr. W. B. Allen growing under an oak in a pasture between Linley Station and a coppice further south, where Mr. George Potts was again successful in obtaining a specimen of *Armillaria bulbigera* (A. and S.) Fr. On the return walk to Linley railway station, the Very Rev. D. Paul boxed some examples of *Lenzites variegata* Fr. Over five hundred and fifty species of fungi and forty-seven mycetozoa were collected during the foray. The Hon. Sec. is indebted to Miss A. Lorrain Smith and Miss E. M. Wakefield for their kind assistance in preparing the subjoined list.

†See description (p. 62).

COMPLETE LIST OF FUNGI GATHERED DURING THE FORAY.

Species not generally distributed are marked *B.* = Bomere; *C.* = Caughley Wood; *H.* = Haughmond Abbey Woods; *P.* = Plowden; and *T.* = Tickwood.

Amanita phalloides (Vaill.) Fr., mappa Fr., recutita Fr., *H.*, muscaria (Linn.) Fr., pantherina (DC.) Fr., *P.*, strobiliformis Vitt., *T.*, solitaria (Bull.) Fr., *T.*, rubescens (Pers.) Fr., spissa Fr., *P.*

Amanitopsis vaginata (Bull.) Roze, fulva (Schaeff.) W. G. Sm.

Lepiota procera (Scop.) Fr., rachodes (Vitt.) Fr., *P.*, Friesii (Lasch) Fr., *Horderley,* acutesquamosa (Weinm.) Fr., *C.*, *T.*, hispida (Lasch) Fr., fulvella Rea (new to science) *C.*, pratensis (Bull.) Fr., *C.*, cristata (A.&S.) Fr., erminea Fr., *H.*, carcharias (Pers.) Fr., *P.*, amianthina (Scop.) Fr., rosea Rea (new to science), haematosperma (Bull.) Boud., *C.*, sistrata Fr., *C.*, Bucknallii B. & Br., *C.*

Armillaria bulbigera (A. & S.) Fr., *Coppice below Linley railway station,* ramentacea (Bull.) Fr., *T.*, mellea (Vahl.) Fr., mucida (Schrad.) Fr.

Tricholoma sejunctum (Sow.) Fr., *P.*, resplendens Fr., *B.*, *P.*, flavobrunneum Fr., albobrunneum (Pers.) Fr., *H. P.*, *T.*, rutilans (Schaeff.) Fr., columbetta Fr.,

Horderley, vaccinum (Pers.) Fr., *Horderley,* terreum (Schaeff.) Fr., argyraceum (Bull.) Fr., *T.,* chrysites (Jungh.) Fr., *T.,* saponaceum Fr., cuneifolium Fr., *P., T.,* sulphureum (Bull.) Fr., bufonium (Pers.) Fr., *P.,* carneum (Bull.) Fr., *P., T.,* album (Schaeff.) Fr., *P., Horderley,* acerbum (Bull.) Fr., *P., T.,* nudum (Bull.) Quél., panaeolum Fr., *T.,* grammopodium (Bull.) Fr., *C.,* melaleucum (Pers.) Fr., brevipes (Bull.) Fr., *P.,* sordidum (Schum.) Fr.

Clitocybe nebularis (Batsch) Fr., *T.,* clavipes (Pers.) Fr., virens (Scop.) Sacc., *H.,* odora (Bull.) Fr., rivulosa (Pers.) Fr., cerussata Fr., *P.,* candicans (Pers.) Fr., *H., T.,* infundibuliformis (Schaeff.) Fr., geotropa (Bull.) Fr., *P.,* inversa (Scop.) Berk., metachroa (Fr.) Berk., ditopus Fr., fragrans (Sow.) Fr., *C., T.*

Laccaria laccata (Scop.) B. & Br., var. amethystina (Vaill.) B. & Br., tortilis (Bolt.) Boud., *B.*

Collybia radicata (Relh.) Berk., platyphylla Fr., fusipes (Bull.) Berk., maculata (A. & S.) Fr., butyracea (Bull.) Fr., vertirugis Cke., *T.,* confluens (Pers.) Fr., conigena (Pers.) Fr., *P.,* cirrhata (Pers.) Fr., *C., B.,* tuberosa (Bull.) Fr., xanthopus Fr., *P.,* succinea Fr., *P.,* esculenta (Wulf.) Fr., acervata Fr., *B.,* dryophila (Bull.) Fr., aquosa (Bull.) Fr., *C., P.,* rancida Fr., *T.,* ambusta Fr., *T.*

Mycena pelianthina Fr., *P.,* pura (Pers.) Fr., coccinea (Sow.) Quél. *C.,* flavo-alba Fr., *H.,* rugosa Fr., galericulata (Scop.) Fr., polygramma (Bull.) Fr., inclinata Fr., *P.,* parabolica Fr., *T.,* atroalba (Bolt.) Fr., *H.,* alcalina Fr., *C.,* ammoniaca Fr., metata Fr., *T.,* filopes (Bull.) Fr., amicta Fr., *H.,* vitilis Fr., *H.,* haematopus (Pers.) Fr., *B., C.,* sanguinolenta (A. & S.) Fr., galopus (Pers.) Fr., var. nigra Fl. D., *P.,* epipterygia (Scop.) Fr., rorida Fr., *C.,* discopus Lév., *T.*

Omphalia atropuncta (Pers.) Quél., *C.,* fibula (Bull.) Fr.

Pleurotus corticatus Fr., *P.,* sapidus Kalchbr., *B.,* ostreatus (Jacq.) Fr., *H.,* applicatus (Batsch) Berk., *B., H.*

Hygrophorus eburneus (Bull.) Fr., *P.,* cossus (Sow.) Fr., *T.,* pudorinus Fr., *P.,* discoideus (Pers.) Fr., *T.,* olivaceo-albus Fr., *P., Horderley,* pratensis (Pers.) Fr., var. pallidus Cke., *T.,* virgineus (Wulf.) Fr., var. roseipes Massee, *P., T.,* niveus (Scop.) Fr., ovinus (Bull.) Fr., *P., T.,* sciophanus Fr., *T.,*

ceraceus (Wulf.) Fr., *P.*, coccineus (Schaeff.) Fr., miniatus Fr., *P.*, puniceus Fr., obrusseus Fr., *P.*, conicus (Scop.) Fr., calyptraeformis Berk., *B.*, *P.*, chlorophanus Fr., psittacinus (Schaeff.) Fr., unguinosus Fr., *P.*

Lactarius scrobiculatus (Scop.) Fr., *T.*, torminosus (Schaeff.) Fr., *B.*, turpis (Weinm.) Fr., pubescens Fr., *B.*, *T.*, blennius Fr., circellatus Fr., *H.*, *P.*, uvidus Fr., *T.*, pyrogalus (Bull.) Fr., *T.*, chrysorheus Fr., *H.*, piperatus (Scop.) Fr., *P.*, vellereus Fr., deliciosus (Linn.) Fr., *T.*, pallidus (Pers.) Fr., *H.*, quietus Fr., aurantiacus (Fl. Dan.) Fr., *C.*, theiogalus Fr., *H.*, vietus Fr., *B.*, *P.*, rufus (Scop.) Fr., *B.*, glyciosmus Fr., *B.*, *T.*, fuliginosus Fr., serifluus (DC.) Fr., mitissimus Fr., *P.*, subdulcis (Pers.) Fr., obnubilus (Lasch) Boud., *H.*, *P.*

Russula nigricans (Bull.) Fr., adusta (Pers.) Fr., *H.*, chloroides (Krombh.) Bres., *P.*, furcata (Pers.) Fr., *H.*, *P.*, incarnata Quél., *P.*, virescens (Schaeff.) Fr., *P.*, lepida Fr., *B.*, *P.*, atropurpurea (Krombh.) Maire *B.*, *H.*, drimeia Cke., T., xerampelina (Schaeff.) Fr., *P.*, vesca Fr., *B.*, *P.*, cyanoxantha (Schaeff.) Fr., pectinata (Bull.) Fr., *H.*, *P.*, foetens (Pers.) Fr., fellea Fr., emetica (Schaeff.) Fr., fallax Fr., *H.*, ochroleuca (Pers.) Fr., fragilis (Pers.) Fr., var. nivea (Pers.) Cke., violacea Quél. *B.*, *P.*, integra (Linn.) Fr., armeniaca Cke., *P.*, lutea (Huds.) Fr.

Cantharellus cibarius Fr., *H.*, *P.*, aurantiacus (Wulf.) Fr., *C.*, *T.*

Nyctalis asterophora Fr., *B.*, parasitica (Bull.) Fr., *B.*, *C.*, *P.*,

Marasmius urens (Bull.) Fr., *P.*, peronatus (Bolt.) Fr., porreus (Pers.) Fr., *P.*, oreades (Bolt.) Fr., globularis (Weinm.) Fr., *H.*, fuscopurpureus (Pers.) Fr., *P.*, erythropus (Pers.) Fr., *H.*, *P.*, foetidus (Sow.) Fr., *T.*, ramealis (Bull.) Fr., rotula (Scop.) Fr., androsaceus (Linn.) Fr.

Panus stipticus (Bull.) Fr., *C.*, *B.*, torulosus (Pers.) Fr., *B.*

Lenzites betulina (Linn.) Fr., variegata Fr., *C.*

Pluteus cervinus (Schaeff.) Fr., salicinus (Pers.) Fr., *C.*, nanus (Pers.) Fr., *C.*, *P.*

Entoloma Bloxamii Berk., *T.*, jubatum Fr., *H.*, *T.*, rhodopolium Fr., *H.*, sericeum (Bull.) Fr., *T.*, nidorosum Fr., *P.*

Clitopilus prunulus (Scop.) Fr., *P.*, *T.*, cretatus B. & Br., *T.*

Leptonia lampropus Fr., *P.*, chloropolia Fr., *T.*, sericella (Fr.) Quél., *P.*

Nolanea pascua (Pers.) Fr., *H.*, proletaria Fr., *H.*, *P.*, papillata Bres., *H.*, *T.*, *P.*, pisciodora (Ces.) Fr., *B.*, *C.*

Eccilia griseorubella (Lasch) Fr., *P.*, *T.*

Claudopus variabilis (Pers.) W. G. Sm.

Pholiota togularis (Bull.) Fr., *C.*, squarrosa (Müll.) Fr., *P.*, spectabilis Fr., *B.*, *H.*, adiposa Fr., *B.*, *H.*, *P.*, mutabilis (Schaeff.) Fr., *B.*, *P.*, marginata (Batsch) Fr., *B.*, *T.*,

Inocybe hystrix Fr., *H.*, cincinnata Fr., *T.*, petiginosa (Fr.) Quél., *B.*, *P.*, pyriodora (Pers.) Fr., *B.*, *P.*, *T.*, incarnata Bres., *T.*, cervicolor (Pers.) Quél., *B.*, calospora Quél., *B.*, rimosa (Bull.) Fr., descissa Fr., *B.*, asterospora Quél., *P.*, geophylla (Sow.) Fr.

Hebeloma fastibile Fr., *B.*, *P.*, *T.*, glutinosum (Lindg.) Fr., *C.*, *T.*, crustuliniforme (Bull.) Fr., *T.*, var. minor Cke., *P.*, *T.*, elatum (Batsch) Fr., *T.*, longicaudum (Pers.) Fr., *H.*

Flammula gummosa (Lasch) Fr., *H.*, alnicola Fr., *P.*, flavida (Schaeff.) Fr., *H.*,

Naucoria melinoides Fr., *T.*, semiorbicularis (Bull.) Fr., *T.*, sobria Fr., *C.*, escharoides Fr., *T.*,

Pluteolus reticulatus (Pers.) Fr., *C.*,

Galera tenera (Schaeff.) Fr., *P.*, hypnorum (Schrank) Fr., mycenopsis Fr., *T.*

Tubaria furfuracea (Pers.) W. G. Sm., paludosa Fr., *B.*, crobulus Fr., *H.*

Crepidotus mollis (Schaeff.) Fr., *P.*

Cortinarius (Phlegmacium) varius (Schaeff.) Fr., *P.*, multiformis Fr., *P.*, glaucopus (Schaeff.) Fr., *P.*, calochrous (Pers.) Fr., *T.*, purpurascens Fr., *P.*, subpurpurascens Fr., *P.*, scaurus Fr., *T.*, decolorans (Pers.) Fr., *H.*

(Myxacium) collinitus (Sow.) Fr., *T.*, elatior (Pers.) Fr., *B.*, *H.*, *P.*

(Inoloma) argentatus (Pers.) Fr., *T.*, pholideus Fr., *B.*,

(Dermocybe) tabularis (Bull.) Fr., *H.*, *P.*, caninus Fr., *B.*, anomalus Fr., *B.*, *T.*, lepidopus Cke., *C.*, semisanguineus Fr., *P.*, cinnabarinus Fr., *B.*, *Horderley*, sanguineus (Wulf.) Fr., *P.*, cinnamomeus (Linn.) Fr., *P.*, *T.*, cotoneus Fr., *T.*,

(Telamonia) torvus Fr., *B.*, *T.*, impennis Fr., *P.*, scutulatus Fr., *B.*, hinnuleus (Sow.) Fr.,

B., *P.*, brunneus (Pers.) Fr., T., psammocephalus Fr., *Horderley*, hemitrichus (Pers.) Fr., *B.*, *P.*, *T.*, stemmatus Fr., *T.*, paleaceus (Weinm.) Fr., *T.*,

(Hydrocybe) saturninus Fr., *T.*, *Horderley*, bicolor Cke., *T.*, *Lythe Wood*, dolabratus Fr., *P.*, *Horderley*, leucopus (Bull.) Fr., *P.*, *T.*, decipiens (Pers.) Fr., *H.*, *P.*, *T.*, acutus (Pers.) Fr., *P.*

Paxillus involutus (Batsch) Fr.

Psaliota elvensis B. & Br., *near Linley railway station* campestris (Linn.) Fr., sylvicola (Vitt.) Fr., *B.*, comtula Fr., *T.*

Stropharia aeruginosa (Curt.) Fr., *B.*, *H.*, *P.*, albocyanea (Desm.) Fr., *H.*, squamosa (Pers.) Fr., *B.*, semiglobata (Batsch) Fr., stercoraria Fr., *T.*

Hypholoma sublateritium (Schaeff.) Fr., *H.*, *T.*, capnoides Fr., *H.*, fasciculare (Huds.) Fr., epixanthum Fr., *H.*, velutinum (Pers.) Fr., *B.*, appendiculatum (Bull.) Fr., *P.*, *T.*, hydrophilum (Bull.) Fr.

Psilocybe sarcocephala Fr., *P.*, uda (Pers.) Fr., *B.*, semilanceata Fr., foenisecii (Pers.) Fr., *P.*, *T.*

Psathyra corrugis (Pers.) Fr., *B.*, *P.*, *T.*, bifrons Berk., *P.*, fibrillosa (Pers.) Fr., *H.*

Bolbitius titubans (Bull.) Fr., *H.*, *T.*

Coprinus atramentarius (Bull.) Fr., *H.*, *T.*, cinereus (Schaeff.) Fr., *B.*, *P.*, niveus (Pers.) Fr., *B.*, *H.*, *P.*, micaceus (Bull.) Fr., *H.*, *P.*, radians (Desm.) Fr., *P.*, plicatilis (Curt.) Fr., *P.*

Panaeolus sphinctrinus Fr., *P.*, campanulatus (Linn.) Fr., papilionaceus (Bull.) Fr., *H.*, *P.*

Anellaria separata (Linn.) Karst., *B.*

Psathyrella gracilis (Pers.) Fr., *B.*, *H.*, *P.*, *T.*, atomata Fr., *B.*, disseminata (Pers.) Fr., *T.*

Gomphidius viscidus (Linn.) Fr., *P.*

Boletus elegans (Schum.) Fr., *P.*, *T.*, granulatus (Linn.) Fr., *H.*, chrysenteron (Bull.) Fr., *H.*, subtomentosus (Linn.) Fr., *H.*, *P.*, edulis (Bull.) Fr., *H.*, reticulatus (Schaeff.) Boud., *P.*, impolitus Fr., *T.*, luridus (Schaeff.) Fr., *B.*, *H.*, *P.*, laricinus Berk., *T.*, porphyrosporus Fr., *P.*, scaber (Bull.) Fr., *B.*, *T.*, felleus (Bull.) Fr., *Lythe Wood.*

Strobilomyces strobilaceus (Scop.) Berk., *Lythe Wood.*

Fistulina hepatica (Huds.) Fr., *H.*, *P.*

Polyporus rufescens (Pers.) Fr., *T.*, squamosus (Huds.) Fr., nummularius (Fr.) Quél., *P.*, intybaceus Fr., *P.*, *H.*, giganteus (Pers.) Fr., *P.*, stipticus (Pers.)

Fr., *P.*, *T.*, lacteus Fr., *P.*, mollis (Pers.) Fr., *B.*, rutilans (Pers.) Fr., *T.*, adustus (Willd.) Fr., *P.*, dryadeus (Pers.) Fr., *H.*, betulinus (Bull.) Fr., *B.*, *T.*,

Fomes applanatus (Pers.) Wallr., *H.*, *P.*, resinaceus (Boud.) Rea, *H.*, pomaceus (Pers.) Quél., *C.*, connatus Fr., *B.*, annosus Fr., *T.*

Polystictus versicolor (Linn.) Fr., velutinus Fr., *H.*, Wynnei B. & Br., *C.*, abietinus (Dicks.) Fr., *T.*

Poria vitrea (Pers.) Fr., *C.*

Ptychogaster albus Cda., *B.*, *P.*,

Trametes gibbosa (Pers.) Fr., *B.*, rubescens (A. & S.) Fr., *T.*

Daedalea quercina (Linn.) Fr., *P.*, *T.*

Merulius tremellosus (Schrad.) Fr., *B.*, lacrymans (Wulf.) Fr., *P.*

Solenia anomala (Pers.) Fr., *P.*

Hydnum repandum (Linn.) Fr., *P.*, *T.*, rufescens (Pers.) Fr., *P.*, ferrugineum Fr., *B.*, zonatum (Batch) Fr., *T.*, squalinum Fr., *B.*, alutaceum Fr., *B.*, udum Fr., *B.*, farinaceum (Pers.) Fr., *H.*

Caldesiella ferruginosa (Fr.), Sacc., *T.*

Irpex obliquus (Schrad.) Fr., *B.*

Radulum orbiculare Fr., *B.*

Phlebia merismoides Fr., *H.*

Grandinia helvetica Fr., *B.*

Craterellus cornucopioides (Linn.) Fr., *C.*, *P.*, crispus (Sow.) Fr., *C.*, *P.*, sinuosus Fr., *B.*

Thelephora anthocephala (Bull.) Fr., *Horderley*, terrestris (Ehrh.) Fr., *B.*, spiculosa Fr., *Horderley*.

Stereum hirsutum (Willd.) Fr., purpureum (Pers.) Fr., spadiceum (Pers.) Fr., *H.*, sanguinolentum (A. & S.) Fr., *T.*

Hymenochaete rubiginosa (Schrad.) Lév., *B.*

Corticium caeruleum (Schrad.) Fr., *H.*, confine Bourd. & Galz., *B.*, *T.*, praetermissum (Karst.) Bres., *B.*, sulphureum (Pers.) *T.* (=Phlebia vaga Fr.)

Peniophora quercina (Pers.) Cke., *P.*, *T.*, hydnoides Cke. & Massee (Odontioid form=Odontia conspersa Bres.), *B.*, pubera (Fr.) Sacc., *T.*, Aegerita von Höhnel, *B.* (with Aegerita candida (Pers.) Fr.)

Hypochnus fuscus (Pers.) Karst., *B.*, *on dead stems of Juncus effusus*, *H.*, *T.*, zygodesmoides (Ell.) Burt., *B.*, ferrugineus (Pers.) Fr., *T.*

Solenia anomala (Pers.) Fr., *B.*, *C.*

Cyphella capula (Holmsk.) Fr., *B.*, galeata (Schum.) Fr., *H.*, muscigena (Pers.) Fr., *C.*

Clavaria muscoides (Linn.) Fr., *P.*, cinerea (Bull.) Fr., *B.*,

P., *T.*, var. gracilis Rea, *C.*, cristata (Holmsk.) Fr., *B.*, *P.*, rugosa (Bull.) Fr., *H.*, *P.*, var. fuliginea Fr., *C.*, Kunzei Fr., *P.*, *T.*, chionea (Pers.) Quél., *C.*, abietina (Pers.) Fr., *P.*, stricta (Pers.) Fr., *P.*, fusiformis (Sow.) Fr., *P.*, luteoalba Rea, *H.*, dissipabilis Britz., *T.*, vermicularis (Scop.) Fr., *T.*, fumosa (Pers.) Fr., *P.*, pistillaris (Linn.) Fr., *P.*

Typhula phacorrhiza (Reich.) Fr., *B.*

Auricularia auricula-Judae (Linn.) Schröt., *H.*

Sebacina incrustans Tul., *B.*, *P.*, *T.*

Exidia recisa (Ditm.) Fr., *P.*, glandulosa (Bull.) Fr., *C.*

Dacryomyces deliquescens (Bull.) Duby, *H.*

Calocera cornea (Batsch) Fr., *H.*

Phallus impudicus (Linn.) Pers., *H.*

Mutinus caninus (Huds.) Fr., *H.*

Sphaerobolus stellatus (Tode) Pers., *P.*

Crucibulum vulgare Tul., *B.*, *H.*

Geaster fimbriatus (Vitt.) Fr., *T.*

Bovista plumbea Pers., *B.*

Lycoperdon perlatum Pers., *T.*, depressum Bon., *P.*, *T.*, caelatum (Bull.) Fr., *P.*, *T.*, pyriforme (Schaeff.) Pers., umbrinum Pers., *P.*, velatum Vitt., *T.*, excipuliforme (Scop.) Pers., *P.*

Scleroderma vulgare Hornem., *B.*, verrucosum (Bull.) Pers., *P.*

Puccinia Violae (Schum.) DC., *T.*, Malvacearum Mont., *H.*, Circaeae Pers., *T.*, obtegens (Link) Tul., *T.*, Primulae (DC.) Duby, *T.*, Betonicae (A. & S.) DC., *T.*, Glechomatis DC., *T.*, Menthae Pers., *B.*, *T.*, *on Clinopodium vulgare*, oblongata (Link) Wint., *H.*, *on Luzula sylvatica.*

Triphragmium Ulmariae (Schum.) Link, *T.*

Phragmidium mucronatum Schlecht., *P.*

Coleosporium Petasitis de Bary, *P.*

Pucciniastrum Circaeae (Schum.) Schroet., *T.*

Melampsora Lini (Pers.) Desm., *T.*

Melampsoridium betulinum (Pers.) Kleb., *B.*, *T.*

Urocystis Anemones (Pers.) Wint., *P.*, *T.*, *on Ranunculus.*

Frankiella Alni (Wor.) Maire, *B.*

Sphacelotheca Hydropiperis (Schum.) de Bary, *B.*

Sphaerotheca pannosa (Wallr.) Lév., *C.*, *T.*

Erysiphe communis (Wallr.) Fr., *T.*, *on Hypericum*, Cichoracearum DC., *T.*, *on Cynoglossum officinale.*

Uncinula Aceris (DC.) Sacc., *P.*, *T.*

Nectria cinnabarina (Tode) Fr., *H.*, *P.*, ditissima Tul., *H.*, episphaeria (Tode) Fr., *H.*, *T.*

Hypomyces lateritius (Fr.) Tul., torminosus (Mont.) Tul., *T., on Lactarius pubescens.*
Cordyceps militaris (Linn.) Link, *H., P.*
Leptospora ovina (Pers.) Fuck., *C.*
Rosellinia aquila (Fr.) de Not., *B.*, Clavariae (Tul.) Wint., *B., T.*
Bertia moriformis (Tode) de Not., *C.*
Leptosphaeria vagabunda Sacc., *T.*
Ophiobolus porphyrogonus (Tode) Sacc.
Valsa populina (Pers.) Wint.
Eutypa flavovirescens (Hoffm.) Sacc., *B.*
Melanconis stilbostoma (Fr.) Tul., *B., T.*
Diatrypella quercina (Pers.) Nke., *B., H., P.*
Diatrype stigma (Hoffm.) de Not., *B.*, disciformis (Hoffm.) Fr., *P.*
Hypoxylon udum (Pers.) Fr., *T.*, semiimmersum Nke., *B.*, multiforme Fr., *H.*, fuscum (Pers.) Fr., coccineum (Bull.) Fuck., *H., T.*
Ustulina vulgaris Tul., *H., T.*
Xylaria hypoxylon (Linn.) Grev., *H., P.*
Phyllachora graminis (Pers.) Fuck., *T.*
Dothidella betulina (Fr.) Sacc., *C., P*
Helvella crispa (Scop.) Fr., *P., T.*, lacunosa Afz., *P., T., Horderley.*
Leptopodia elastica (Bull.) Boud., *C.*, ephippium (Lév.) Boud., *T.*
Acetabula ancilis (Pers.) Boud., *B., C.*
Macropodia macropus (Pers.) Fuck., *B.*
Aleuria ampliata (Pers.) Gill., *B.*,
Galactinia badia (Pers.) Boud., *B.*, succosa (Berk.) Sacc., *C., T.*
Otidea onotica (Pers.) Fuck. *P., Horderley.*
Peziza aurantia Pers., *H.*
Lachnea hemisphaerica (Wigg.) Gill., *P.*
Ciliaria scutellata (Linn.) Quél., *B., P.*
Cheilymenia coprinaria (Cke.) Boud., *T.*
Coprobia granulata (Bull.) Boud., *H., P.*
Ascobolus stercorarius (Bull.) Schröt. (syn. furfuraceus), *H.*
Trichoglossum hirsutum (Pers.) Boud., *T.*
Geoglossum ophioglossoides (Linn.) Sacc. (syn. glabrum), *P.*
Microglossum viride (Pers.) Gill., *Horderley.*
Leotia lubrica (Scop.) Pers., *H., P., T.*
Cudoniella acicularis (Bull.) Schröt., *C., P.*
Ombrophila imberbis (Bull.) Boud., *B.*

Calycella citrina (Hedw.) Quél., *B.*, *C.*
Coryne sarcoides (Jacq.) Tul., *B.*, *C.*, *T.*
Bulgaria inquinans (Pers.) Fr., *H.*, *P.*
Calloria fusarioides (Berk.) Fr., *B.*
Orbilia xanthostigma Fr., *H.*, luteorubella (Nyl.) Karst., *P.*, coccinella (Somm.) Fr., *B.*, *P.*
Phialea firma (Pers.) Gill., *B.*, *H.*
Chlorosplenium aeruginosum (Oeder.) de Not., *H.*, *P.*
Helotium herbarum (Pers.) Fr., *B.*, *T.*, fructigenum (Bull.) Fuck., *P.*, virgultorum (Wahl.) Karst., *B.*, *T.*, moniliferum (Fuck.) Rehm, *B.*
Dasyscypha virginea (Batsch) Fuck., *B.*, C.
Trichoscypha calycina (Schum.) Boud., *T.*
Hyaloscypha hyalina (Pers.) Boud., *C.*, *H.*
Mollisia cinerea (Batsch) Karst., melaleuca (Fr.,) Sacc., *C.*
Karschia lignyota (Fr.) Sacc.
Stegia Ilicis Fr., *C.*, *T.*
Rhytisma acerinum (Pers.) Fr., *H.*, *P.*, *T.*
Pilobolus crystallinus (Wiggers) Coem., *H.*
Phoma herbarum Westend.
Libertella faginea Desm.
Oidium alphitoides Griff. & Maulb., *B.*, *H.*, *T.*
Cephalosporium acremonium Cda.
Trichoderma lignorum (Tode) Harz., *B.*
Amblyosporium botrytis Fres., *B.*, *on Lactarius vellereus.*
Rhinotrichum Thwaitesii B. & Br., *B.*, repens Preuss.
Sepedonium chrysospermum (Bull.) Fr., *H.*
Ovularia obliqua (Cke.) Lindau, *H.*
Botrytis vulgaris Fr., epiphylla Pers.
Ramularia calcea (Desm.) Ces., *P.*, *T.*
Cladosporium epiphyllum (Pers.) Mart.
Macrosporium commune Rabenh.
Alternaria tenuis Nees.
Isaria farinosa (Dicks.) Fr., *B.*, *P.*
Aegerita candida (Pers.) Fr., *B.*
Tubercularia vulgaris (Tode) Tul.
Epicoccum vulgare Cda.
Anthina flammea Fr., P.
Ozonium auricomum Link.

Since the above list was in the press Dr. Bayliss Elliott informs me that she found the following species :—Otidea leporina (Batsch) Fuck., *T.*; Calycella claroflava (Grev.) Boud., *T.*; Pachydisca Laburni (B. & Br.) Boud., *T., on Corylus;* Hyalinia inflatula (Karst.) Boud., *P.*, *T.*; Hyalinia Leightoni (Phill.) Boud., var. lignicola n. var. *P.*; Calloria extumescens Karst., *B.* (new to Britain); and Rhinotrichum Thwaitesii B. & Br., var. fulvum Grove.

MYCETOZOA SEEN DURING THE VISIT OF THE BRITISH MYCOLOGICAL SOCIETY TO SHREWSBURY, SEPTEMBER 24th to 29th, 1917.

By Gulielma Lister, F.L.S.

In the following list the places visited are referred to by their initial letters; *P.* for Plowden and Horderley Woods; *H.*, for Haughmond Abbey Woods; *T.*, for Tickwood; *B.* for the woods round Bomere; *C.* for Caughley Woods. Forty-seven species of Mycetozoa were found.

Badhamia utricularis (Bull.) Berk. *H.* Plasmodium only seen.

B. panicea (Fr.) Rost. *P., H.*

B. rubiginosa (Chev.) Rost. var. *globosa* Lister. *B.* found on soil and dead wood as bright yellow plasmodium which in a few days formed into sporangia.

Physarum psittacinum Ditm. *C.* the sporangia are weathered; this is usually a summer species.

P. viride (Bull.) Pers. *T.*

P. nutans Pers. *P., H., T., B.* var. *robustum*. Lister *C.* In this gathering the sporangia have stalks that are white from included lime-granules; they closely resemble *Physarum leucopus* Link in general appearance, but the character of the capillitium with its abundant and rather straight hyaline threads is that of *P. nutans* var. *robustum*. The specimen was on dead wood; *P. leucopus* seems to be found usually on dead leaves.

P. compressum Alb. & Schw. *B.*

P. cinereum Pers. P., T.

Fuligo septica Gmel. *H.* var. *candida* (Pers.) *B.*

Craterium minutum (Leers) Fries *H., T.*

C. leucocephalum Ditm. *T.*, in great abundance, *B.*

C. aureum (Schum.) Rost. *B.*

Leocarpus fragilis (Dicks.) Rost. *P.*

Diderma floriforme Pers. *B.* A large growth on a birch log.

Diachaea leucopoda (Bull.) Rost. *H.*

Didymium difforme (Pers.) Duby. *P., C.*

D. nigripes Fries. *H.*
D. melanospermum (Pers.) Macbr. *H.*
D. squamulosum (Alb. & Schw.) Fries. *P., H., T.*
Mucilago spongiosa (Leyss.) Morgan *P.*
Colloderma oculatum (Lippert) G. Lister. This species may be included in the present list although sporangia did not make their appearance till a month later on a bit of dead wood picked up at Horderley, and and brought home because it looked " promising " for *Colloderma*; that is to say the wood was partially clothed with a layer of gelatinous green algae, associated with which *Colloderma* has several times been found.
Stemonitis fusca Roth. *P., H., B., C.*
S. flavogenita Jahn *H., B., P.*
Comatricha nigra (Pers.) Schroeter *P., H., T., B.*
C. typhoides (Bull.) Rost. *H., B.*
Enerthenema papillatum (Pers.) Rost. *H., P.*
Dictydium cancellatum (Batsch) Macbr. *B.*
Dictydiaethalium plumbeum (Schum.) Rost. *P., H.*
Tubifera ferruginosa Gmel. *B.* Abundant on birch logs.
Reticularia Lycoperdon Bull. *B., T.*
Lycogala epidendrum (L.) Fries. *H., B., C.*
L. flavofuscum Ehrenb. *H.* A large aethalium of this uncommon species was found some feet from the ground on a beech tree the wood of which was partially decayed.
Trichia affinis de Bary. *B., C.*
T. favoginea (Batsch) Pers. *H., B.*
T. persimilis Karsten. *P., B., H., T.*
T. varia Pers. *P., H., T., B.*
T. decipiens (Pers.) Macbr. *P., H., T., B.*
T. Botrytis Pers. P.
Oligonema nitens (Lib.) Rost. *B.* A single development was found on a stick lying on moist earth by Bomere.
O. flavidum Peak *B.* Found in some abundance on the under side of logs lying on wet ground at the edge of Bomere. That the logs had been recently under water was proved by the fresh gelatinous masses of the eggs of a pond-snail attached to the wood close to the shining yellow clusters of *Oligonema* sporangia. Partially submerged logs appear to be a favourite habitat for both the species of this genus.
Hemitrichia clavata (Pers.) Rost. *B., C.*

H. Vesparium (Batsch) Macbr. *B.*
Arcyria cinerea Pers. *T., H.*
A. pomiformis (Leers) Rost. *P., H.*
A. denudata (L.) Sheldon. *P., H., T., B.*
A. incarnata Pers. *P., H., B., T.*
A. nutans (Bull.) Grev. *P., H.*

PRESIDENTIAL ADDRESS.

By Annie Lorrain Smith, F.L.S.

THE RELATION OF FUNGI TO OTHER ORGANISMS.

The subject I have taken for consideration has recently been impressed on my mind in my study of the development of lichens and of the relationship and inter-action between the fungus and the alga, the two constituents of the lichen thallus.

From the mass of material bearing on the question I have selected some of the more important facts and instances, the results of research carried out by workers on many different aspects of this subject. It is impossible to do much more than give a sketch, as the subject is a very vast one.

Fungi, as we know, are dependent on other organisms for the carbohydrates, without which life cannot be sustained. To obtain these at second hand, as it were, is their great task in life, and it has been achieved in various ways: fungi have demonstrated that there are many different methods of securing the means of subsistence.

The only sources from which organized products can be obtained are either from dead material of plants or animals, in which case the relation is harmless or saprophytic, or from living bodies, by a parasitism which is antagonistic and harmful. There is however a third possible relationship known as symbiosis or mutualism, in which the two organisms—the body yielding the carbohydrates and the fungus—are mutually helpful. One might also include the symbiosis of bacteria with the animal organism, which is

often one of great benefit; but bacteria have not been included in the present survey.

Saprophytism. The saprophytic relationship is the most simple of all. There are no special organs of absorption or excretion in fungi; the active hyphæ travel over and through the dead substances—mostly wood, leaves, &c., and are constituted to take up food material over their whole surface. By means of ferments, in which they are peculiarly rich, they break up organic compounds and thus render them serviceable not only to the fungus itself but to the other plants. This fermentative action of fungi has been made use of in many different economic processes, and was familiar to experience for long ages before science gave the explanation. Most of our field fungi, large and small, are saprophytes and of great economic importance in breaking up organic remains which otherwise would hopelessly encumber the ground.

Parasitism. Parasites and saprophytes are intimately related. Certain fungi are constantly parasitic, they are obligate parasites, while others are facultative parasites, being able to pass from one condition to the other. There is no apparent distinction between the hyphæ of the different types: in all there are branching septate filaments, and, as Zellner* has pointed out, there are no principal differences between their cell contents, though as parasitic hyphæ are in direct contact with living protoplasm, the substances they excrete may be toxic and give rise to pathological phenomena.

Interesting experiments have been made on the origin of parasitism, which tend to prove that it is an acquired habit. Ray† found, for instance, that after prolonged culture on nutritive media, *Ustilago Maydis,* underwent certain changes that lessened its power of attacking the living host plant: it reverted to the saprophytic condition. Massee‡ studied the matter from the standpoint of the host, and he demonstrated that there is some substance in the cells of the host that is attractive to its particular fungal parasite "in other words, infection is due to positive chemotaxis." By injecting a substance chemotactic to a saprophytic fungus into the cells of the host, he could induce the saprophyte to become parasitic. It has also been observed that certain fungi pass very easily from the saprophytic to the parasitic stage even in natural surroundings. Massee§ quotes an instance observed by him in *Cladosporium epiphyllum,* a

* Zellner, '10. † Ray, '03. ‡ Massee, '04. § Massee, '14.

common saprophytic brown mould: it grew on the sugary exudations from the glands of *Clerodendron fallax* leaves, then gradually passed beyond the range of the gland, forming conspicuous dead patches on the leaf. Three weeks from the time when the injury was first noted, the spores of the fungus—a series of generations having intervened—were capable of infecting any part of the leaf.

The closeness of relationship between saprophytes and parasites is also well exemplified in the fungi that live on insects. Miraude* has demonstrated the presence of glucose in the chitinous covering of insects, located more especially at the place of insertion of the muscles but also spread over the whole surface. It is this substance presumably that attracts and affords sustenance to *Laboulbeniae, Saprolegniae,* etc. The fungi of these families are true saprophytes, but a case of parasitism has been proved† against a species of the former. *Trenomyces histophthorus* in which a tube from the basal spherical cell of the fungus emerges, pierces the cuticle of the insect and feeds on the adipose tissue, without, however, doing much injury to the host.

Method of parasitic attack. The fungus spore on germination emits a tube which is a very delicate structure. The higher plants are easily protected from its attack as to the trunks and branches by layers of cork—subject however to wounds and cracks; and as to the leaves by a covering cuticle which is interrupted at intervals by stomata. The germinating fungus most frequently gains entrance through these accidental or natural openings, and after reaching the interior the mycelium develops haustoria which pierce the living cells.

Certain leaf-fungi directly enter the host by piercing the cuticle. In the case of *Botrytis cinerea* a facultative parasite of the lily, Blackman and Welsford‡ have shewn that after germination the spore tube from the side lying against the leaf produces a peg-like outgrowth which pierces the cuticle by mechanical pressure alone. The large family of Erysiphaceae and such epiphyllous genera as *Asterina* and *Meliola*§ form haustoria at intervals along the creeping hyphæ which pierce the cells of the leaf and extract the required nourishment. It is only the larger hyphæ that form these haustoria, though the finer filaments may attack the cuticle to some extent.

The position of the hyphæ within the tissue varies with

* Miraude, '15. † Chatt. & Pic., '08.
‡ Black. & Wels., '16. § Maire, '08.

each type of fungus: in many cases it is intercellular, with occasional haustoria piercing the cells: thus *Phytophthora,* the potato disease, is confined mainly to the intercellular spaces and the cell walls, while *Pythium* hyphæ enter the cells, feed on the contents and pass to others.

In many or most tree and root parasites the fungus first gains entrance by wounds. *Fomes annosus,* a root rot, enters between the bark scales and reaches the living cortex killing the parenchyma by means of ferments; it penetrates the wood and travels up to the stem through the woody elements, lateral hyphal branches entering the medullary rays and the adjoining tracheids: the cells are delignified by the fungus from within outwards, the delicate lamellae remaining for a while as a skeleton and then also disappearing. The same action on the cells is effected by *Polyporus squamosus.* Different fungi have, however, different methods of attack. Marshall Ward* found that *Stereum hirsutum* causes delignification of the wood first, while *Collybia velutipes* consumes the cellulose and leaves the lignin behind.

The injury done to the host consists in the seizing of its oxygen, water and food supply, and by means of ferments converting them into substances required by the fungus. That the ferments may be also most virulently toxic was proved by Brown† who injected certain host plants with an extract from the *Botrytis* fungus and found that it produced exactly the same effect as the living fungus: in half an hour after treatment the cells of a potato had become disorganized and the brown or black colouration shewed that the contents had been killed. The cells were macerated by the ferment which dissolves the middle lamella; but the death of the cells only takes place at a late phase of the process of disorganization of the cell walls. The extract cannot, however, dissolve the cuticle: entrance must first be gained by mechanical means. It was found that the ferment could be rendered innocuous by heat, by violent agitation or by alkalis. In a study of yeast enzymes Bokorny‡ found that these were affected by poison in the same way as protoplasm, but they are more resistant so that it was possible to kill the protoplasm and yet leave the enzyme uninjured.

Reaction of the host cell. In many cases of disease, as in *Botrytis,* the fungus is directly toxic in action and the cells are quickly destroyed. This is not however always the case,

* Marshall Ward.

† Brown, '15 & '16. ‡ Bokorny, '06.

nor typical of parasitism generally. It has, on the contrary, been frequently observed that leaves attacked by fungi become more brightly green shewing thus increased assimilation, and transpiration is generally stronger in infected than in healthy leaves. There is also frequently a certain prolonged resistance, a reaction of the host plant that indicates increase of vitality due to toxic excitation by the fungus. There may be an abnormal growth and increase by division of the neighbouring cells so that a barrier of new tissue is often interposed against the invader. Thus in the attack of *Prunus* leaves by *Cylindrosporium,* Higgins* has described how the hyphæ of the fungus, gaining entrance by the stomata, travel towards the epidermis, generally of the upper surface where a thin stroma is built up which gives rise to the spores. Meanwhile beneath the stroma there is formed by the host a layer of much swollen cells which constitute a separation layer, so that in time the part of the leaf affected breaks away at the region of these cells leaving a "shot-hole." The swelling of the cells was found by Higgins to to be due to the breaking down of the amygdalin molecule of the host cells into smaller molecules by the emulsin of the fungus thus greatly increasing the pressure. As a result of the dropping out of the affected area, the fungus secures dispersal, but the leaf also benefits by casting out the diseased portion.

Another aspect of host reaction takes the form of "immunity" of varying degree to fungus attacks. Stakman† and others consider that the success of infection, including the successful development of the parasite, depends on the degree of symbiosis between the two organisms. In plants susceptible to fungus attacks, the hyphæ grow vigorously without immediately affecting the host cells to any great extent. In resistant forms the fungus gains entrance, but the cells in the neighbourhood are at once disorganized and killed and further penetration by the fungus is entirely hindered. The degree of resistance is thus commensurate with the rapidity of action. The hyphæ eventually die off either from lack of suitable nourishment, or possibly, Stakman thinks, there may be some very definite antagonism between the cells of the immune plant and the fungus which requires further explanation. Immune plants are often varieties or strains of susceptible species, and this peculiarity, as in the case of wheat, potato and other economic plants, is of very great importance in combating disease.

* Higgins, '14. † Stakman, '15.

Hypertrophy is a very frequent result of fungoid attack. There is a great increase in cells, and these revert to more primitive forms of tissue. Galls arise and there is abnormal development of leaves and shoots. Perhaps the most familiar and striking examples are the Witches' Brooms due to *Exoascus*.

Deformations and galls are also caused by the parasitism of certain Uredineæ, cases of which were investigated by Ruth Stämpfli.* She found galls might arise on stems, leaf-stalks or leaves, in the latter, usually on the veins. The palisade parenchyma is most influenced; epidermal cells and spongy parenchyma are altered in character, but do not take much part in gall formation. Leaf-stalks and stem galls arise through the activity of similar tissues, chiefly through the enlargement and increase of the pith, of the woody tissues, and of the cambium, and to a lesser degree of the cortex, phloem and epidermis. She found that usually there is a tendency for the tissues to revert to the more simple parenchyma structure; the thickening of cell-membranes both in wood and in bast fibres is less complete, while the cortex, pith, and other parenchymatous tissues are distinctly more developed.

†Wakker also has placed on record the changes induced in the host by various parasites. He finds in all true cases of hypertrophy an enlargement of the host cells with consequent obliteration of the intercellular spaces, as also certain alterations in the contents of the cell such as colouration of the cell-sap, the formation or the disappearance of crystals and the transitory accumulation of starch grains. There is also a formation in some cases of new tissues such as in the vascular bundles of *Cruciferæ* attacked by *Peronospora,* in the meristem in the overgrown cells of *Viola odorata* and of *Zea Mays* under the influence of *Ustilago,* and the exceptional sclerenchyma formation in the stem of *Cirsium arvense,* following infection by *Puccinia suaveolens*. In other instances there is a disappearance of tissues as, for instance, of interfascicular cambium in the host plants of *Cystopus candidus,* and more or less of the cambium, phloem and secondary wood in *Rhamnus,* due to the presence of an *Æcidium*.

In *Exobasidium* on *Vaccinium,* &c., the leaf-blister is due to the enlargement of the parenchyma cells, which also become more rounded and of simpler form, a reversion to a more primitive type of structure, while specialized tissues,

* Stämpfli, '9-'10. † Wakker, '92.

such as the stomatal, bundle and strengthening, are modified or undeveloped: very rarely does hypertrophy coincide with any forward developments.

A case of parasitism so harmless to the host as to have suggested symbiosis is described by G. R. Sutherland.* He found on the marine alga, *Pelvetia canaliculata,* the fruits of *Mycosphaerella Pelvetiae* n. sp., and he traced the mycelium of the fungus permeating the algal tissues in all directions without visibly injuring the host. The fungus in this case evidently lives on the mucilage and other excretions of the loose algal tissues. It fruits on the outer rind of the algal receptacles where nutritive substances would be especially abundant and as the spores issue from the Mycosphaerella perithecia some of them germinate in contact with the escaping oospores of the alga and thus readily infect the new host plant in its earliest stages.

In true cases of symbiosis there is mutual advantage afforded by the two plants one to the other. There is a delicate balance of gain which may tip to one side or the other causing disaster to one of the two plants, symbiosis giving place to parasitism; such varying results are to be found in the root fungus termed *mycorrhiza.*

Mycorrhiza. This name was first used by Frank† to designate the fungi that in their association with the roots of the higher plants vary between parasitism and symbiosis. He distinguished two types—ectotrophic and endotrophic—according as the hyphæ were external or internal. His researches convinced him that the higher plant had become more or less dependent on the fungal hyphæ as an intermediary agent between it and the humus of the soil: recent workers have questioned the universal truth of that statement.

Ectotrophic or external mycorrhiza is specially distinctive of the *Cupuliferae* and *Coniferae* and also appears in many other trees, shrubs etc. The fungus becomes attached to the outer wall of the root near the tip and then branches and spreads, forming a complete hyphal mantle and destroying the root hairs. Some branches of hyphæ from the mantle spread over the soil or humus on which they feed, others penetrate between the epidermal cells; they destroy the middle lamellae and split apart the cells of the outer cortex. The growth in length of the root is inhibited and excessive branching is induced, leading to the coral like formation of rootlets characteristic of this type of mycorrhiza.

Though the hyphæ of ectotrophic mycorrhiza do not enter

* Sutherland, '15. † Frank, '92.

the cells, they use up the cell-sap that passes between adjoining cells. McDougall§ holds that these fungi are in the main parasitic. This view was also held by Nadson* though he agreed with Frank that while dislodging the root hairs the fungus by its travelling hyphæ had taken over the provision of water and food materials, and this is undoubtedly the case.

Endotrophic mycorrhizas penetrate more deeply into the tissues: they are intra- as well as inter-cellular. A very exhaustive account of this type of fungus as affecting *Neottia Nidus-avis* was published by W. Magnus.† In that orchid the fungus gains entrance into the roots, and branches out occupying concentric layers of cells, three to four cell rows (from without inwards), while some six rows in the rhizome and stalk may be infected. The fungus penetrates the cells by means of haustoria which branch out within the cells forming a coil round the outer wall, from which new hyphal haustoria pierce to the cytoplasm of the cell and secure nourishment. Such cells Magnus designates as host cells in which the fungus never degenerates; they occupy in *Neottia* the central cells of the invaded tissue. In the cells of the outer and inner layers, on the contrary, the fungus dies off and is digested by the host protoplasm which increases rapidly; these are termed by Magnus digesting cells. Any undigested remains of the hyphæ in these cells are balled together as excreted material and are invested by layers of cellulose. In *Neottia* there is no possibility of the fungus conveying food from the open as it is entirely endophytic, and as *Neottia* possesses no chlorophyll, it has been suggested that the outer root cells possess a power, due to the irritant action of the fungus, of absorbing carbohydrates from the humus of the soil.

Fungi are constantly associated with Orchids as endophytes, though the arrangement of host, and digesting-cells is not so regular as in *Neottia*. In some species the seeds will not germinate without the aid of the fungus in the culture: possibly some irritant is supplied.

A very remarkable case is described by Kusano‡ in *Gastrodia elata,* a Japanese Orchid. It forms tubers which require to be infected by the rhizomorphs of *Armillaria mellea,* before the plant can develop flower and fruit. As in other Orchids, there is some resistance to the entrance of the fungus in the outer zone. In a deeper layer the fungus

§ McDougall, '14. * Nadson, '08. † Magnus, '00.
‡ Kusano, '11.

destroys the contents of the cells while in the innermost cells the hyphæ are digested by the host.

Endotrophic mycorrhiza is a very wide spread phenomenon and appears in many plants both in Monocotyledons and Dicotyledons. Gallaud* who studied thoroughly this type held that the hyphæ were attracted chemically by the roots; they penetrate the outer cells of the cortex and, in the deeper seated cells, they form branching haustoria termed "arbuscules," while on the tips of the hyphæ swollen vesicles are formed which function as reserve organs or may become reproductive bodies. In some cases only occasional cells are entered by the fungus; in others every cell of the cortex may be infected; the fungus never penetrates the vascular cylinder nor does it invade chlorophyll cells. The hyphæ may be coiled round the nucleus of the cell or may have no relation with it; they pass from cell to cell but they do not destroy the middle lamellae, nor split the cells apart as in ectotrophic mycorrhiza.

A wonderful instance of mycorrhiza association has been worked out by Miss Rayner† in *Calluna* and some other Ericaceae. She found that the seeds already harboured the mycelium of the fungus in the testa so that as the seed germinated, the hyphæ infected the seedling and formed mycorrhiza on the roots; without such infection all growth ceased and the seedling died off. Infection may begin at the tip of the root by hyphæ finding their way into the cells in which is formed a tangle of fine filaments. The fungus eventually spreads over and within the whole plant—root, stem, branches and leaves—so that when the seeds are formed it is again present. It penetrates continually from the open into any part of the host with ease and, within certain cells, it forms coils of extremely attenuated filaments which are then digested and used by the host. It even invades the chlorophyll cells and though it is digested, the chloroplasts and contents also suffer disintegration.

From pure cultures of the fungus evidence was obtained that it belonged to the genus *Phoma* or to *Phyllosticta*.

In discussing the biological relations between the host and the hyphæ of endophytic mycorrhiza, Cyril West‡ recognizes three different relationships:—

1.—A real symbiosis: (A) the host provides habitation, and carbohydrates (especially starch); (B) the fungus yields up to the higher plants mineral salts absorbed from the soil, and proteids converted by it from the humus. The fungus may also fix nitrogen from the air to the benefit of the host plant.

* Gallaud, '05. † Rayner, '15. ‡ West, '17.

II.—The host plant derives the greater advantage as in *Gastrodia elata.*

III.—The fungus evidently gains most as in many of the series of endophytic mycorrhizas.

Fungi have been demonstrated once and gain as somewhat harmless inhabitants of the thallus of hepatics: they may interfere with the metabolism of individual cells but they do not seem to produce any effect on the general life of these plants. A beneficial symbiosis with mosses has however been established by Servettaz.* He made a series of cultures of mosses on artificial media, and, in the cultures of *Phascum cuspidatum*, he found present a fungus of the *Oospora* type which reacted in an extraordinary way on the development of the moss. So important was the presence of the fungus, that without it the moss did not advance beyond the protonema stage, while in control cultures which were associated with the fungus, the stem had, during a similar period, reached full growth. Servettaz ascribes the advantage as due to gases produced by the fungus along with acid products formed by it from the glucose of the nutritive medium.

Lichen symbiosis. The most complete case of a living association between fungi and green plants is to be found in the large and varied class of lichen plants in which is represented a successful instance of mutual give and take between the two components, algae and fungi. Lichens as a well marked and recognizable group of plants have been known and classified from the early days of botanical study side by side with other divisions of the vegetable kingdom, though their exact relation to other groups was long a puzzle to systematists. Many workers had recognized the extraordinary likeness of the lichen plant to algae on the one hand and to fungi on the other, but it was Schwendener who about sixty years ago had the courage to announce the dual hypothesis, that two different organisms were combined in the lichen thallus. This theory, much combated at first, has been gradually accepted by lichenologists, and the controversies which never cease to rage round lichens, now centre on the relation between the two symbionts, the alga and the fungus. It is here also a question of nutrition, and of the mutual adaptation of the two associated plants to their composite existence.

It has been strongly held by some that the association is one of parasitism or semi-parasitism and that the fungus

* Servettaz, '13.

reaps most benefit from the alliance, since the carbohydrates so necessary to the continued life of the hyphæ are always being prepared and yielded up by the green cells which are eventually destroyed, with but little compensating advantage at any time. There is however a very delicate interchange of food material going on between the symbionts, it is not a simple tale of mere plunder. Pure cultures of allied algae and even of lichen gonidia—the term applied to algae within the lichen—have been made by various workers, and they have proved, that on certain substances such as vegetable acids, the green cells can live and thrive and form not only carbohydrates but even chlorophyll in the dark, and in the absence of carbon dioxide. Such substances as well as nitrogenous material are supplied more or less abundantly through the agency of the lichen fungus and contribute to the support of the algal partner, though the first and most fruitful source of carbon supply must be through the natural channel of assimilation from the atmosphere.

Lichen Algae and Fungi, and their method of association. Lichen Fungi belong to the Ascomycetes, with the exception of a few Basidiomycetes which form lichens in tropical countries. Lichen hyphæ are filamentous, branched and septate with apical development and frequently with thickened gelatinous walls, which absorb and retain moisture.

The algal cells or gonidia belong to the aerial Myxophyceae or Chlorophyceae, and are one-celled organisms or at most shortly filamentous. They increase within the lichen plant by cell-division or by sporulation, though in free conditions reproduction may be by zoospores.

The Myxophyceae or blue-green algae are mostly distinguished by their colouring and by the gelatinous cell-sheaths: the hyphæ as a rule permeate the sheath, leaving the cells intact. This type of contact prevails in *Gloeocapsa* and allied algal forms; in *Rivularia, Scytonema* and *Stigonema* algae which grow in tufted filaments, the hyphæ travel along their sheaths sharing in the apical development of the alga and the lichen formed is, like those algae, of tufted form. *Nostoc,* a coiled filamentous form, yields abundant mucilage which, in Collemaceae, is threaded by the lichen hyphæ. Certain cells of the *Nostoc* chain, however, were shown by Bornet to be attacked and entirely destroyed by the fungus, thus breaking the chain to short lengths which continue a healthy existence.

In the Chlorophyceae, which are mostly non-gelatinous,

the relations are naturally somewhat different. The filamentous forms are represented in one genus by *Cladophora* in others by *Trentepohlia*. The latter alga has frequently thick corrugated walls. In the lichen *Coenogonium*, which contains *Trentepohlia*, the composite structure is filamentous; the fungus either travels alongside the algal strands or surrounds them by a hyphal network. Growth is apical and considerable development in length may be attained; the fruits which—as in all lichens are fungal fruits—arise laterally on the strands which are thus vitally active well back from the growing point, the alga as well as the fungus maintaining all along a healthy existence. In other genera, such as in *Graphideae*, the *Trentepohlia* filaments are broken up and they lose their distinctive form and colour, but if they reach the open they at once resume their normal filamentous growth.

In *Graphideaæ* indeed the symbionts are mutually dependent to a striking degree: they lead but a meagre existence until contact or even mere association is established, when each partner is seen to take on new vigour. There has been no record of parasitized *Trentepohlia* cells.

The great majority of our familiar lichens are associated with *Protococcus* or closely allied species, the algae that in damp conditions cover stones, palings and trees with a cheerful green. The region of growth in lichens is at the edge of the thallus and there, as the hyphæ extend and branch, active cell-division goes on in the algal cells. These, as a general rule, are herded into a narrow zone beneath the upper cortex, where conditions are most favourable for photosynthesis. A section through this zone shews an abundance of green cells, some in the stage of increasing. Existence may be, doubtless is, restricted, but does not seem to be particularly unhealthy and interchange of food-stuffs must be constant between the symbionts. It has, however, been observed once and again by various workers that certain algal cells may be disturbed if not destroyed by the fungus.

A projection or haustorium from a fungus hypha may pierce the outer wall of the alga; the attack frequently excites the alga to prompt cell division, which by this means becomes free from the haustorium. In other instances, however, the haustorium penetrates to the centre of the cell, branches inside and destroys the contents. Elenkin, a Russian Botanist, claims to have proved by his researches and experiments, that such destruction of algal cells goes on to a very large extent at the lower side of the algal zone. He found in that region so many empty and destroyed algal

cells that he called it a 'necral zone'; Elenkin therefore rejects the symbiotic theory and looks on the association as one of modified parasitism.

While not rejecting Elenkin's facts, we would point out the necessary decay of all living organisms, when vitality becomes exhausted. The fungus in the lichen thallus suffers loss in the superficial layers owing to the wear and tear of life, and these losses are compensated for by new upward growth from the gonidial region. In the same way the lower algae have been gradually pushed down to positions further away from the light: they may have reached and passed their maximum of vitality and there is no doubt that decaying algae would promptly be used up by the hyphæ as food. That cells in the close grasp of the hyphæ remain active and healthy is abundantly proved by soredial development. Soredia consist of one or more algal cells generally completely invested by actively growing thin-walled hyphæ. Each one is a lichen thallus in miniature: it represents a budding off from the parent plant of the two constituents. At certain areas of some thalli, breaks occur in the cortex and soredia like a white powder escape into the open. They are scattered and vegetatively reproduce the lichen; in many species they are the chief form of reproduction, both the symbionts being ready for active increase.

We conclude therefore that in lichens there is a true symbiosis or mutualism, by which the fungus has acquired so much vigour, that a whole new class of plants with well-defined peculiarities of structure and of cell products have been evolved. The alga has been less affected than the fungus, but it has gained in capacity of endurance against time and against unfavourable conditions, impossible without the shelter of the thallus and in some cases has attained to much greater size as in the *Stigonema* of *Ephebe* or the *Trentepohlia* of some species of *Coenogonium*.

The conception of symbiosis is familiar to us in many different cases, and fungi have adapted themselves to that mode of life with very considerable success, all the more easily that they do not make large demands for sustenance: they are able to live on an extraordinarily meagre diet, and with the possible exception of resting spores and stromatoid formations, they make no provision for storage. They are the happy-go-lucky members of the plant kingdom which yet have their appropriate place and function, though at times driven by some need to become predatory and therefore enemies in the plant society.

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LICHENOLOGY, A NEW DEPARTURE.

By A. Lorrain Smith F.L.S.

The question of adding Lichenology to our field of activity has been mooted several times, and after a short discussion at a recent meeting of members, it was decided that there was good reason for extending and enriching the scope of our work by associating the study of lichens with that of mycology.

There are numbers of 'fungi-lichens' or 'lichen-fungi' just on the border-line between saprophytism and symbiosis with algae, and much careful and exact work is waiting to be done on these species out in the field and in the laboratory, by some one acquainted with both fungi and lichens. There is also a very large flora of the smaller fungi parasitic on lichen thalli which will mainly be discovered and recognized by the student of lichens. A descriptive list of these was recently published in the Bulletin de la Société Mycologique de France Vols. xxviii.—xxx (1912-14) by the deeply lamented Abbé Vouaux, who was wantonly done to death by the Germans in the early stages of the war.

The great bar to the study of lichenology in our country has been the lack of suitable text-books, that lack will be, I hope, made good very soon. A general text-book on Lichenology is ready and awaits publication. The Monograph of British Lichens is now completed and a guide-book somewhat on the lines of Hayward's pocket flora is in an advanced stage of preparation. The two latter works are being published by the Trustees of the British Museum. It is earnestly hoped that these books will appeal to natural history students and will make the science easier and more attractive. It will be possible to appoint in the early future a member of our Society who will act as general referee for lichens.

OBSERVATIONS ON THE BIOLOGY OF SOME SAND-DUNE FUNGI.

By E. M. Wakefield F.L.S.

The following notes were for the most part made during July 1917, on some species of Agarics found growing on sand-dunes near the village of Oxwich, on the Gower coast, South Wales. Very little work has been done on the fungus-flora of sand-dunes, though Wheldon's list of the fungi of the Lancashire dunes* shows how surprisingly large this fungus-flora may be. It has been thought worth while to place these few observations on record, as offering some suggestion as to the means by which delicate Agarics manage to exist in what is apparently so unfavourable a habitat.

Psilocybe ammophila Mont.

This species, which is absent from Wheldon's list, occurs abundantly on the Gower dunes in the summer months, after rain. It grows on the exposed slopes of high dunes, usually about the tufts of Marram grass (*Ammophila arundinacea*). When dug out the stem appears to be clavately swollen below, and continued downwards as a tapering, rooting base. As a matter of fact the stipe itself is of equal diameter throughout, as may be seen in a vertical section, and it terminates abruptly an inch or so beneath the surface of the sand. The apparently clavate lower half, and the long root-like base are due to a weft of fine hyphæ mixed with particles of sand, which surrounds the buried part of the stem, and is continued downwards as a gradually tapering cord. This cord, however, is very different in structure from an ordinary mycelial cord. Consisting merely of loosely interwoven hyphæ, the interstices being filled with sand, it is extremely fragile, and hence difficult to trace to its point of origin.

After many attempts to dig out the underground portion of the fungus, I was at length able to satisfy myself that it is always connected with buried, decaying leaves of the Marram grass. Only occasionally, however, does it

*H. J. Wheldon in Lancash. and Chesh. Naturalist, 1914.

arise from a single leaf. It may do so if the leaf is near the surface, in which case the sandy cord is seen to be directly connected with a weft of hyphæ mixed with sand particles which surrounds the dead leaf. In the majority of cases the points of origin are more deeply seated. The " root " tapers to about the thickness of medium twine, and then, if great care has been taken in excavating, is found to fork or branch repeatedly. It is as a rule impossible to trace the ultimate ramifications on account of their fineness and fragility, but in a few cases I was successful in tracing a branch to a dead Ammophila leaf, which was covered by a fine weft of hyphæ. It appears therefore that the mode of nutrition of *Psilocybe ammophila,* though on a much smaller scale, is similar to that of *Collybia platyphylla,* in which a single sporophore is connected by a complicated branching system of underground cords with various decaying twigs, leaves, etc.

Geopyxis ammophila Sacc. of which an interesting description was published by Trail in the Annals of Scottish Natural History, 1893, pp 37-40, is probably similar in its mode of life. This species was noted by Trail to have an elongated " rooting stem," which is exceedingly fragile. In this case the grass with which it was associated was *Elymus.*

Coprinus Friesii Quél.

Another interesting Agaric found in July was a small species of Coprinus, apparently *C. Friesii* Quél. This occurred in one of the numerous hollows in these dunes which are liable to inundation at spring-tides from the overflowing of a small stream. In the bottom of such hollows the only phanerogamic vegetation is usually *Juncus maritimus* with occasional plants of *Glaux maritima.*

The Coprinus grew gregariously in patches, on the slopes of the tiny sand-hillocks formed round the tufts of *Juncus.* At first sight it appeared to be growing from the sand, but on investigation it was found that the clusters of fruit-bodies always arose from the dead stems of the *Juncus,* exactly at the surface of the sand. Hitherto I have only found this fungus on one occasion, which was on the day after a whole day's rain. The sand beneath the surface and the buried *Juncus* stems were saturated with moisture. On returning to the same spot a few days later, after a dry interval, I was only able to see a few shrivelled fruit bodies.

This fungus agrees well in macroscopic characters and in habitat with Quélet's original description of *C. Friesii;* it also agrees in micro-characters with Lange's description in his monograph of the Coprini of Denmark and with the

description of *C. tigrinellus* Boud., which is said to be very close to *C. Friesii.* Quélet described *C. Friesii* as growing on dead but still erect stems of grasses. Lange finds it typically on dead grass, and also a form on dead *Phragmites* straw, and another form on bits of straw from horse-droppings. *C. tigrinellus* Boud. grew on dead erect stems of *Carex,* and has been recorded in this country both on *Carex* and on *Juncus.*† All these forms thus agree in growing on dead erect stems of grasses, sedges, or rushes, in damp places. They agree closely also in macro- and microscopic characters, the chief point distinguishing *tigrinellus* from *Friesii* being that the flecks on the pileus are deep brown instead of white. As in my specimens the colour of the tomentum varied from white to rust-brown, it seems probable that *C. tigrinellus* and *C. Friesii* are hardly specifically distinct. The name Friesii is used as being the earlier.

Bolbitius tener Berk. and *Galera rubiginosa Fr.*

In the same hollow where the *Coprinus Friesii* grew, there occurred two small brown-spored Agarics, *Bolbitius tener* Berk. (distinguished from the more common species of Bolbitius by its white and less fragile pileus), and *Galera rubiginosa* Fr.

These grew directly from the sand, and were not connected in any way with any phanerogamic plant. In the course of digging up some specimens it was noticed that the top layer of sand came away easily as a flat crust about $\frac{1}{8}$in. in thickness. The fungi had no rooting base, the stipes ending abruptly in this upper crust of sand. Closer examination showed that the crust was slightly tinged green, and it was subsequently found that this colour was due to innumerable minute algae with which the sand was permeated. The algal layer consisted mainly of a species of *Oscillaria,* but a few unicellular green forms were also present.

These two species of Agarics, therefore, must have subsisted practically entirely on the small amount of humus derived from the algal crust. The Galera grew gregariously, in considerable quantity. *Bolbitius tener* was also represented by a number of specimens, but was not so abundant as *Galera rubiginosa.*

Inocybe dulcamara Fr. and *I. eutheles* B. and Br.

In the "slacks" or damp hollows of the dunes, and on dune-pasture, where phanerogamic vegetation is more

†Naturalist, 1908, p. 320.

abundant, the presence of Agarics is less difficult of explanation. Where there is a close carpet of grass, with other small flowering plants, mosses, liverworts, etc., there is necessarily a fair amount of humus mixed with the surface layer of sand. Consequently a number of species of fungi are to be found in such habitats. At the time these notes were made, in July, the most abundant species in the "slacks" was *Inocybe dulcamara* Fr. It grew for the most part on the ground beneath *Salix repens,* but specimens also occurred amongst the short grass in the open and in this position showed certain distinct variations, no doubt due to their greater exposure to light.

Specimens growing under the dwarf willow averaged about 1½in. in diameter, but were occasionally larger. The rather fleshy pileus was tomentose-squamulose (not squarrosely scaly), and of a uniform rich tawny colour. When growing in the open the stem was shorter and the pileus smaller and more tough. The pileus of the sheltered specimens was practically always hemispherical and scarcely umbonate, whereas specimens in the open were more distinctly umbonate, and when old often showed an upturned margin. Furthermore, the tomentum, especially about the umbo, was in the exposed individuals aggregated to form little squarrose scales, of a distinctly darker brown than the margin of the pileus. These scales often eventually became rubbed off, leaving the pileus almost smooth and innately fibrous or strigose. Along with these external differences, a slight spore-variation was noticeable in the exposed specimens. In these the spore was inclined to be more obovate, or even somewhat triangular in shape, whereas in the sheltered specimens it was regularly elliptical. It is interesting to find such variations correlated with a distinct difference of exposure. In other respects, as to general aspect, absence of cystidia, type of gill edge, etc., the two forms agreed exactly, and were obviously variations within one species.

A single collection of *Inocybe eutheles* was made in the same situation, under *Salix repens,* but *I. rimosa,* which Wheldon notes as being abundant on the Lancashire dunes, was not present, at least at the time when I was able to examine the Gower dunes.

There is no doubt that if sand-dunes were examined thoroughly at all seasons of the year their fungus-flora would be found to be surprisingly rich, and much might be learnt as to the adaptation of species to these unpromising conditions.

ON THE METHOD OF GROWTH OF THE CONIDIAL CLUSTERS OF TRICHOTHECIUM ROSEUM.

By Jessie S. Bayliss Elliott, D. Sc. Birm., B. Sc. Lond.

On examining a dense mass of Trichothecium roseum which had been growing for some months on decaying vine leaves in a moist chamber, I came across what at first I thought was an abnormal method of conidia formation.

Crowning the tops of most of the conidiophores were dense racemes of conidia, more or less pendulous (fig. 1a), instead of the usual clusters (fig. 1b); some of the racemes were as long as the erect hypha bearing them.

The conidia were not inserted on an axis as anticipated but each conidium except the terminal one was attached to two others and thus a long raceme-like chain was formed (fig. 2).

The method of growth is peculiar and is basipetal; each conidium including the first arises obliquely (fig. 3a) sometimes even horizontally at the apex of the conidiophore, this is cut off from the conidiophore by a cell wall, and beneath the cell wall the hypha swells out into another conidium also obliquely placed and opposite the other one, but still attached to it (fig. 3b) and in its turn, it becomes cut off and so the process continues (fig. 3), conidia one after another in a close spiral being produced by the swelling out of the apex of the conidiophore; and thus a chain is produced in which each conidium is attached to two others, and of which the terminal conidium is the oldest, and the one the most recently formed is at the top of the hypha.

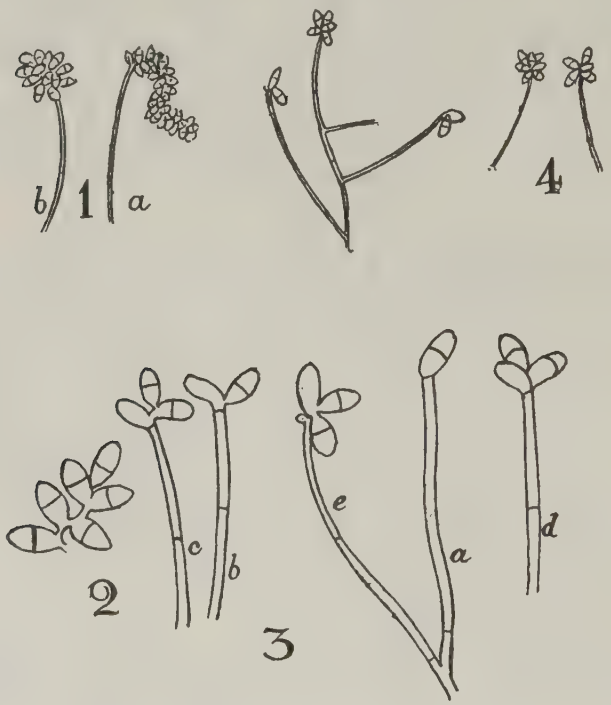
The various stages are easily followed in a small culture made in a hanging drop.

Under ordinary circumstances only a very short raceme or chain is produced, and this has evidently been mistaken for a head of conidia, because the conidia are very crowded together; but it has the same basipetal method of formation and the conidia are not inserted as they are usually figured—at the same level on the top of the conidiophore.

Under the favourable conditions of growth in a still, warm, moist, covered culture chamber instead of the usual small cluster of conidia or apparent head, a long pendulous structure is formed.

Grove* considers that *Cephalothecium roseum, Trichothecium roseum, T. candidum, T. obovatum, C. candidum* are varying states of one's species, and I am of the same opinion, but he further mentions Harz's suggestion that the genus *Arthrobotrys* also is only a more highly developed form of *Trichothecium* and that if so *Arthrobotrys superba* and *A. oligospora* and *A. rosea* are also other states of the same species: with the latter suggestion I do not agree since the conidial chains formed by the above described basi-petal mode of growth could hardly lead to the formation of the nodal conidiophore of Arthrobotrys.

* Grove: New or Noteworthy Fungi, part IV., Journal of Botany, 1912, p. 14.



EXPLANATION OF FIGURES.

1. a, Pendulous cluster of conidia, × 65.
   b, A head of conidia—the usual form, × 65.
2. Part of pendulous cluster, showing attachment of conidia to one another, × 800.
3. Conidiophores showing basipetal method of conidia formation, × 800.
4. Young conidiophores with small clusters of conidia, × 800.

ON TWO-SPORED BASIDIA AND OTHER MATTERS.

By A. A. Pearson, F.L.S.

During the last two years I have had occasion to examine the microscopic characters of a large number of Hymenomycetes. My observations have chiefly been made on the Agarics, and of course have not been exercised over sufficiently long a period to permit of any conclusions of a general character. I find, however, that so few students of the larger fungi trouble about the microscopic details of these organisms, that the observations I have made may be found interesting. There is curiously little of a concrete character to be found in the fungus floras, and new species of Agarics have been made even in recent years without any particulars of a microscopic character other than spore measurements being given.

It would of course be wrong to suggest that such studies have been entirely neglected. Mr. Cotton in his 1913 Presidential address to this Society gave us some useful information on this score. Among French mycological works, those of Patouillard are justly esteemed, and his " Hyménomycètes d' Europe " and his later and completer " Essai Taxonomique " are evidence of a profound study of the larger fungi, but even recently it was not very evident that such studies were being made use of by systematists. In such a modern work as that of Messrs. Bigeard & Guillemin, the second volume of which was published in 1913, we find the most meagre and frequently incorrect microscopic details given, spores being measured by length only, as copied from Quélet for the most part, and no mention being made of the cystidia which, I have no hesitation in saying, will be of considerable help in the elucidation of many groups which up to the present have been imperfectly studied. Perhaps it is hardly fair to mention this work, which is supposed to be of a popular character. However, in spite of the pioneer work of their compatriots, only recently have the French appreciated the need for using the microscope more extensively in the taxonomic studies of the Agarics, and the admirable and indeed almost too elaborate notes of Monsieur René Maire

in the "Bulletin de la Société Mycologique de France" are doubtless the beginning of a more thorough revision of this large order of Fungi. We are all looking forward to Monsieur Maire's promised monograph of the genus Russula, the general lines of which he laid down some time ago. The completion of such work is reserved, we hope, for better and happier days.

Patouillard published his "Hyménomycètes d' Europe" in 1887 and his "Essai Taxonomique" in 1900, but neither of these contains any description of species. As far as I know he has not published any monographs of the kind which mycologists are pining for. I picture Patouillard as snowbound in a vast accumulation of mycological notes from which he cannot escape. He amuses himself by throwing out a few notes on foreign or extra-European species, which are published by various journals, but which nobody reads. The perfect systematic work on European Hymenomycetes which might have been written by him is left for some future worker to produce.

Turning from France to Germany, Dr. J. Schroeter published the first volume of "Die Pilze Schlesiens" in 1889. This first volume contains the Hymenomycetes. It is so very rarely mentioned by British mycologists when dealing with Agarics, that it is only just to call attention to it as the beginning of what could be done on a larger scale. Unfortunately it contains comparatively such a small number of species of the larger fungi, that it cannot be considered as much more than a general sketch of a new classification with numerous detailed examples. It is therefore of very little practical value for general use to-day. Many of the commonest species are missing, and such a large genus as *Russula* only contains 33 species, divided between white spored and yellow spored, the latter being placed in a separate genus—*Russulina*. Schroeter was evidently as bewildered as we are when faced with the necessity of giving systematic coherence to the *Russulae*. Many other genera are equally sketchy, and his specific names are maddening, but on the other hand we have good macroscopic and microscopic description of many species, doubtless of those he had examined himself, and he gives very careful and, as I have found, reliable measurements of the spores and cystidia, although I doubt whether measurements of cystidia are of any use—it is important to know if they exist and what their shape is, or if they project beyond the basidia. Schroeter made a feature of the cystidia or sterile projecting cells on the gill edge.

I have not consulted other German works; doubtless there are many books and papers scattered among the botanical literature of the world which, if properly correlated would add to our specific knowledge of the Agarics. One of the features of the first number of our transactions in 1897 was a list of recent foreign mycological publications in the form of short notices. I would like to see this feature revived and extended; it would be a useful guide to students.*

When we come to the English works on the Agaricaceae, I find very little microscopic detail given. There is of course Massee's monograph of the genus *Inocybe,* which is indispensable to all who would identify the species of this puzzling genus, although one frequently meets with species that do not fit into his framework. It is, however, a basis for future workers and that is what is so badly wanted. Fortunately we are likely to get it from the Danish mycologist, J. K. Lange,† who has published in English three booklets during the last three years, the first containing microscopic particulars of the Mycenae of Denmark, the second dealing with the genera *Amanita, Lepiota* and *Coprinus,* and the third with *Pluteus, Collybia* and *Inocybe.* Mr. Lange's English is rather quaint. For instance, he describes his work as supplying a "documentary fundament" to the study of the agarics; but in spite of these occasional lapses he writes with clearness, and I hope we shall appreciate the compliment he pays us in writing in our language. I must leave to others more competent to judge as to whether Mr. Lange's specific determinations can be relied upon. If they can be accepted as correct, I have no hesitation in saying that his work will be of enormous assistance towards the elucidation of the Agaricaceae. His tables of spore figures are especially to be commended. The shapes of spores reproduced with the same relative magnification are very helpful and may sometimes be decisive in identifying a species. Spore descriptions in the old works are often too vague to be of any value. Such a word as "elliptical" is used for a variety of shapes. Massee used the description "pip-shaped" in a somewhat indiscriminate fashion. The spores of most species present some differentiating feature. When growing under natural conditions these features are fairly constant. Small differences do exist, but are not of material importance. A

*Mr. Ramsbottom has, during the last few years, dealt fully in our Transactions with the cytological papers which have appeared in the different countries, and we all hope he will be able to continue his fine work.

† Published by Dansk Botanisk Forening, Copenhagen.

careful drawing of the spore is therefore of considerable taxonomic value.

Amongst other valuable data given by Lange, he points out that several species of Mycenae have two spored basidia; for instance *Mycena galericulata, lactea, gypsea, Adonis, filipes*, and many others.

I have not been able to confirm many of these yet, but I have no doubt that we could add considerably to the list. For instance, what I believe is generally accepted as *Mycena metata* has 2-spored basidia. In this connection I came across an interesting note among some delightful coloured sketches of Mycenae made by Miss Ivy Massee. The note was written by the late Mr. George Massee in his own characteristic handwriting and referred to a specimen of Mycena named by Berkeley as *metata* which had 2-spored basidia. Lange gives 4-spored basidia to this species, but says that a 2-spored form had been met with in some cases. He also mentions that he found one specimen of *Mycena rorida* with two spored basidia; the specimens of this species which I have examined have all had two spored basidia, which brings me to the question whether this feature is a sufficiently stable one to justify its use for the purpose of identifying or helping towards the identification of a species. We know that in some sections of the Hymenomycetes, the character of the basidium is very unstable. The resupinates are remarkable in this respect, as Miss Wakefield has shewn us in her descriptions of British species and Bourdot & Galzin in their splendid contributions to the transactions of the French Mycological Society.

Mr. Rea has told me that he knows of no paper shewing that species of 2-sterigmata have continued through a succession of pure cultivations in producing two sterigmata only, and that four sterigmata species do not occasionally deteriorate or progress to this condition. I do not quite appreciate his view of the need for pure culture experiments in a matter of this kind.* My own experience, however, partly confirms his healthy scepticism. I have in fact observed that certain species are found sometimes with two, sometimes with four sterigmata. *Naucoria semi-orbicularis* is of this type; so is *Galera hypnorum*. I am a little doubtful, even, about *Mycena galericulata*. Patouillard gives a sketch of the two spored basidia of *Mycena galericulata*

* Curious changes may take place under cultivation which are an unreliable guide to what happens in nature. A case in point is the cultivated mushroom, that tasteless product of richly manured soil in dark cellars. This is supposed to be a variety of the field mushroom (*Psaliota campestris* (Linn.) Fr.). The latter has normal quadrisporous basidia, but the cultivated variety (var. *hortensis*) usually has basidia with two sterigmata only.

var. carneifolia in his *Tabulae analyticae Fungorum* and queries whether the two spored basidia are found in the other varieties. However, I think the genuine Mycena galericulata has 2-spored basidia and those we find with 4-spored basidia belong to some other species. For instance, the so-called variety *calopus* is not a variety at all, but a distinct species and we should call it to-day *Mycena inclinata*. Then there is at least one small species of *Coprinus* which has two spored basidia but seems to vary the monotony of life by producing basidia with 3 and possibly 4 sterigmata. On the other hand certain species would appear consistently to have basidia with two sterigmata. One of the groups of *Nolanea* which we have been in the habit of lumping together under the name of *pascua* has two spored basidia. Schroeter has described a Nolanea under the name *Hyporhodius cetratus*, the basidia of which, he says, have two long awl-shaped sterigmata. This may be the same species as the one I have so often examined and which there can be little doubt is the genuine *pascua* of Persoon & Fries. A species of *Naucoria* which appeared frequently in various places on Wimbledon Common within the last two years always has two spored basidia. I have examined numbers of this species and always with the same result. A similar remark applies to *Pholiota pumila*, and also to a species of *Galera* which grows on cultivated ground manured with cow-dung. I have been calling it *Galera antipus* but I have only found two specimens with the long fusiform base which gave this species its name. Then there is a viscid species of Mycena belonging to the *epipterygia* type which is sometimes met with in pine woods. It grows rather plentifully in the pine woods of Oxshott and St. George's Hill, Surrey. This always has two spored basidia and the spores are different in shape and size from *Mycena epipterygia*. It is probably a distinct species.

Now it seems to me that if after repeated examination of specimens gathered from different places it is found that a species always has two spored basidia, it is desirable to mention this feature in the description, and it will be found a valuable aid for identifying the species. After all, Schroeter, who was certainly a most competent mycologist, considered this feature alone as a justification for a new genus of *Clavariaceae*. Species familiar to us as *Clavaria rugosa, cinerea and cristata* are called by him *Clavulina rugosa, cinerea** and *cristata*, because they all

* Patouillard gave a figure of the two spored basidia of *Clavaria cinerea* in his Tabulæ analyticæ.

have 2-spored basidia. Not that this appeals to me very strongly; as a worker in the field I do not fancy the use of microscopic characters for marking off genera unless they are accompanied by macroscopic distinctions as well. It is pleasant to be able to say unhesitatingly that this is an *Inocybe* or that a *Clavaria* and so on. However, I am afraid that the field men will have to retire before superior forces when an open-air mycologist like Mr. Rea shews a desire to adopt Schroeter's genus *Asterosporina* for the rough spored *Inocybes*, and Patouillard's *Androsaceus* for the filiform *Marasmii* with warted cystidia on the pileus, which are by no means easy to observe in all cases.

But I must not enlarge further on this subject.

In this short paper, I have only dealt in a concrete manner with a comparatively unusual feature in the Agarics. I have found that two spored basidia are not often met with except among the smaller species. The large fleshy agarics under natural conditions do not appear to produce any but 4-spored basidia: I am of course only referring to the genuine agaric; among the Cantharellaceae, basidia with a varied number of sterigmata are not uncommon, but among the Agarics proper the 4-spored basidium is the normal arrangement. Lange has shewn that this normal arrangement is departed from in certain species of the genus *Mycena*. He has used this feature, together with the still more useful phenomenon of the cystidia on the gill edge, to construct a key which enables one to identify the Mycenae of his native country, and he is preparing similar keys for other genera. Every mycologist is aware of the difficulty of running down small specimens of Mycena and Galera. They are as often as not put aside as impossible to identify with sufficient accuracy to make it worth while troubling about them. Doubtless many species are not recorded—one might almost say they are not recordable in macroscopic terms only, except perhaps by the use of a group name. The relative differences cannot be described with sufficient clearness to distinguish them, although one may carry the distinguishing points in one's eye. If it is proved that microscopic features are of some assistance, we many find that the maze of descriptions of appalling similarity can be supplied with guide posts which will put us on the road to the correct identification.

I have endeavoured to give you a glimpse of my initial efforts in the microscopic study of the smaller agarics. In addition to the authors cited, I have been helped by

Professor Buller's illuminating biological studies and by the unfailing kindness and severely critical attitude of our hon. secretary, Mr. Carleton Rea. I have also been helped by the use of an unusually high-powered eye-piece (Orth. Ok n. Kellner F=15.) which I obtained last year for my microscope. This has enabled me to observe the gill both in section and on the flat face without exercising as much skill as is expected from the professional microscopist. Fine razor sections are rarely necessary. The gill when observed on the flat will be seen to have a regular spacing for the spores, either like a series of double-four dominoes, when the basidia are quadrisporous, or they will be spaced in pairs when the basidia are bisporous. In most species there is no difficulty in making the observation. In some, however, the basidia project so little and the spores are so transparent, that a section must be made. Rough sections are usually sufficient, and no cover glass need be used. It is better always to make the observations both on the flat and in section, thus avoiding the chance of errors. The use of the high power eye-piece combined with a low-power objective enables one to make observations quickly. This is essential with the small fleeting Agarics. I have never used this eye-piece for measuring spores or cystidia but only for observations on the naked gill. When the high-power objective is used, as it must be for measuring spores, one can get clearer definition with a less powerful eye-piece.

The advantage, however, of using a low powered objective is that one can get better illumination and look at the gill in the natural state without making fine sections or distorting the fibres with a cover glass. Such observations are confessedly imperfect and possibly of only very restricted scientific value. They are better than nothing, and as they are within reach of people without laboratory training or experience, it seems desirable to encourage them. For it is important that field mycologists should use the microscope more than they do; it adds so enormously to the interest and value of their work. What a revelation it is for instance to see the horned cystidia of *Pluteus cervinus* or the spacing pegs of many of the Coprini. A knowledge of the existence of cystidia gives a new meaning to the fringe of colour seen so often on the gill edge and leads one to think they may be organs of excretion or transpiration. Other kinds probably have a totally different function. In fact endless biological problems are open to the student, who need not be repelled by the thought of the mysterious methods of the professional worker, with his acquired skill in cutting sections and using staining agents.

Mr. Rea has pointed out that no mention has been made of René Maire's "Recherches Cytologiques & Taxonomiques sur les Basidiomycètes," published in 1902. This is an omission that should certainly be rectified, and on again looking through this masterly work, I find several interesting points bearing on the matters dealt with in the foregoing paper. Maire proposes a new classification of Basidiomycetes based on the more intimate characters of the cell: on the transverse or vertical position of the kariokinetic spindle. Such studies are beyond the reach of ordinary busy mortals like myself and are hardly likely to form an acceptable basis for classification.

Maire creates a new genus, the outstanding feature of which is that the basidia are uniformly bisporus. Hygrophorus conicus and Hygrophorus ceraceus are transformed into *Godfrinia conica* (Scop.) R. Maire, and *Godfrinia ceracea* (Wulf.) R. Maire. Thus we are shewn another group of Agarics where this phenomenon asserts itself.

Maire also studied *Mycena galericulata,* and compares his observations to those recorded by Wager in 1894, but the Mycena galericulata described by Maire has 4-sterigmata, and we are left wondering whether this is the same species as studied by Wager.

As I have touched upon Schroeter's new genus *Clavulina,* I ought to mention that according to R. Maire's observations, it would appear that the basidia in *Clavaria rugosa* are not uniformly bisporous. Maire writes:

> "Le nombre de stérigmates est typiquement de quatre, mais ce cas se trouve rarement réalisé et la plupart des basides ont deux stérigmates, d'autres trois, d'autres un seul."

I should have said that under the circumstances the basidia are typically but not uniformly two-spored. Presumably Maire adopts the view that the perfect or typical basidium has four sterigmata and that it is in the nature of things that all basidia should strive after perfection which some fail to attain.

Another work which every student of the Agarics should consult is the *Prodrome d'une Histoire Naturelle des Agaricinés* by V. Fayod, which was published in the Annales des Sciences Naturelles, 1889. He points out that basidia with two sterigmata are rare, but they are a characteristic feature of *Hygrophorus agathosmus, Hygrophorus conicus, Mycena tenerrima, Tubaria conspersa* and *Pholiota togularis.*

NEW OR RARE MICROFUNGI.

By A. Lorrain Smith F.L.S., and J. Ramsbottom M.A., F.L.S.

Mr. Ramsbottom's departure for Salonika to assist in the military hospitals has prevented him from joining in the final revision of these pages for the press. As in previous years we have to thank Mr. D. A. Boyd for the very valuable material he has sent. The new genus of Discomycetes, *Discocera,* was discovered by W. Watson while collecting lichens. Our special thanks are due to him for sending us such an interesting plant.

PHYCOMYCETES.

Rhizophidium acuforme (Zopf) Fisch. Rabenh. Krypt. Fl. I. 4, p. 93, 1892.

Sporangia of the host cell sometimes seated on stalks, often crowded in groups of 1-10, globose or lemon-shaped 6-16μ diam., with a short apical papilla, and at the base, a slender branched minute rhizoid. Zoospores minute, 2μ in diam., globose, with minute oil-drops and one cilium. Resting spores smaller than the sporangia, globose, with a large oil-drop almost filling the cells.

On *Chlamydomonas intermedia* in a cart-rut at Harborne, April 1917. Coll. W. B. Grove. (New Phytologist xvi. pp. 177-80 (1 fig.) 1917).

PYRENOMYCETES.

Melanospora lagenaria Fuck.

Already recorded for Britain (Trans ii. p. 93, 1905). It has been found by D. A. Boyd at Eglinton, Ayrshire, Aug. 1917. The perithecia are mostly in groups; the spores are slightly larger than the size given, measuring about 16 × 7μ. It grew on *Polystictus versicolor* along with *Hypomyces aurantius.*

Chaetomium pannosum Wallr. Flora Crypt. Germ. II. p. 267, 1833.

Perithecia solitary or generally in crowded groups, ellipsoid, up to 0.5 mm. high, 0.3-4 mm. thick, with a short

colourless ostiole. Rhizoidal hyphæ abundant. Lateral hairs of the perithecium tapering, brown, incrusted; terminal hairs spreading, branched, very stiff, the cell walls thick, incrusted, brown. Asci large, clavate, stalked, up to 100μ × 15-20μ 8-spored; spores ellipsoid (side view fusiform) apiculate at each end, olive-brown, 10-14μ × 8-9μ.

On decaying branches and stalks of herbaceous plants. The above fungus was found by Miss Winifred Page on a culture mixed with dung solution at Birckbeck College. Feb. 1918.

DISCOMYCETES.

DISCOCERA gen. nov.

Ascomata parasitica, sessilia, immarginata, colorata, firme ceracea; disco patellato, dein plano-convexo. Asci clavati, supra rotundati, inoperculati, 8-spori; paraphyses tenerae, supra ramosissimae, epithecium densum formantes; Sporae ellipsoideae, continuae, hyalinae.

A somewhat remarkable genus resembling *Humaria* in the appearance of the large smooth spores, but the inoperculate asci and the branching of the paraphyses to form a dense epithecium show its affinity with the lichenicolous genus *Nesolechia*.

D. LICHENICOLA n. sp.

Ascomatibus subrotundatis, usque ad 1.5 mm. latis, fusco-coccineis, glabris. Ascis elongato-clavatis c. 140μ × 20μ, membranis ad apices c. 12μ crassis, cum iodo vino-rubescentibus; paraphysibus tenerrimis, c. 1μ crassis, septatis, supra persaepe ramosis, interdum irregulariter nodosis, hyalinis, granulosis, ad basim coalitis; sporis glabris, intus roseo-hyalinis, guttulatis 20-26μ × 10-13μ.

Ad thallum Lichenis, supra saxa. Coll. W. Watson at Treborough, Somerset, Dec. 1915.

The fungus is a dark crimson-red when dry, but when moistened becomes lighter in colour, and, under the microscope, the whole ascus contents, more especially the spore guttulae, are a beautiful rose-red.

SPHAEROPSIDEAE.

Phyllosticta fuchsiicola Speg. Fungi Chil. p. 138, 1910; Sacc Syll xxii. p. 839, 1913.

Spots whitish, orbicular, on both sides of the leaf 1-5 mm. across, determinate and bordered by a wide purple line. Pycnidia few; innate, lentiform, minute, 75-90μ diam.,

ostiolate, membranaceous; spores colourless, subcylindrical-ellipsoid, 4-6μ × 1.5-2μ.

On living leaves of *Fuchsia coccinea*.

Recorded by Spegazzini from Chili. A specimen corresponding to the above has been found by Mr. D. A. Boyd at West Kilbride, Ayrshire, on the dead bark of Fuchsia stems. There is a difference of habitat (on stems instead of leaves) and no specialized spots, but the similarity is otherwise very close.

Ascochyta Papaveris Oudem. Contr. Fl. Myc. Nowaja Senilaja p. 12, l.i., fig. 10, 1885; Sacc. Syll. x. p. 301, 1892.

Pycnidia scattered over the surface of the leaves, black, small, 200μ diam., the peridium membranaceous, of rather large fuliginous cells; spores broadly fusiform or sub-ellipsoid, hyaline, 1-septate, 9μ × 3.5μ.

On leaves of *Papaver nudicaulis* in the island of Nova Zembla. Specimens have been collected by D. A. Boyd on the leaves of *Dicentra spectabilis* which agree fairly closely with the above description. The pycnidia are scattered or congregate from 135μ to 170 in diam., with a minute pore about 35μ diam. The spores are fusiform or sub-ellipsoid and measure 8-12μ × 2-3μ.

Septoria Scillae Westend. in Kickx Fl. Crypt. Flandres I. p. 423 (1867).

Leaf spots pale-brown. Pycnidia semi-immersed, brownish, becoming darker, about 200μ in diam; spores long, cylindrical, straight or slightly bent, 50-75μ × 2.7μ; 5-7 irregularly septate, colourless.

On leaves of *Scilla nutans*.

Coll. by D. A. Boyd, May, 1917 at West Kilbride, Ayrshire.

Kickx describes the pycnidia of his species as brown. Allescher has recorded them as black. They became darker with age but so far I have not seen any black specimens.

S. violae-palustris Died. Krypt. fl. Mark Brandenb. ix. p. 522, 1914.

Leaf spots at first very small, round, later up to 4 mm. across, thin, transparent, surrounded by a thickish, reddish-brown line. Pycnidia epiphyllous, numerous, semi-immersed, the upper surface composed of darker cells, and about 75-90μ wide with a pore about 12μ wide, Spores

filiform, indistinctly guttulate, straight or bent, 25-40μ × 1-1.2μ.

On leaves of *Viola palustris*.

Collected by D. A. Boyd on fading leaves of *Viola palustris* at Ardrossan, Ayrshire Aug. 1916. The fungus agrees wholly with that described by Diedicke though some of the spores from the Ardrossan specimen are slightly longer.

S. Chenopodii Westend. Bull. Acad. Roy. Belg. 1851, p. 396; Sacc. Syll iii. p. 556.

Var. *emaculata* Grove in Journ. Bot. lv. p. 348, 1917. Pycnidia occurring on stems without distinct spots.

On living plants of *Atriplex* and *Chenopodium*.

S. Oenanthis Ell & Ev.

This species was previously found by D. A. Boyd on *Oenanthe* leaves in Cumbrae and at Ardrossan (Trans. v. p. 245, 1916). He now sends further specimens from West Kilbride, which occurred in a damp wood on the stems of the host, and which were causing the death of the plants. In these stem pycnidia, the spores measure up to about 48μ in length but do not otherwise differ from those on the leaves.

Camarosporium Stephensii Sacc. Syll. iii. p. 469, 1884. *Hendersonia Stephensii* B. & Br. Not. Brit. Fungi n. 502 in Ann. Mag. Nat. Hist. vii. p. 95, 1851.

" Perithecia irregularly seriate under the brown epidermis, bursting in a wide line; spores large, ovoid, reticulately cellular.

On dead stems of *Pteris aquilina,* Bristol."

This fungus has not again been recorded and the description is somewhat indefinite, but one found by D. A. Boyd is evidently the same:—the pycnidia have a thin, dark brown cellular wall and measure about 300μ across. The spores on short colourless sporophores are as described by Berkeley and Broome: they are divided by three stout transverse septa and the compartments are irregularly divided again by longitudinal and transverse delicate walls; they measure about 45μ × 20μ and become browner with age.

Collected by D. A. Boyd on stems of *Pteris aquilina*. Cumbrae, Buteshire, June 1915.

MELANCONIACEAE.

Myxosporium lanceola Sacc. & Roum. Rev. Mycol. 1884, p. 36.

Acervulae gregarious, like tubercles, bursting the epidermis, flesh coloured, with a darker base, white above; spores elongate, fusiform, guttulate, colourless, 20-22μ long (or shorter), about 4μ thick; sporophores rod-like, half the length of the spores.

On dead bark of *Quercus Robur*. D. A. Boyd, Stevenston, Ayrshire, Sept., 1917.

M. pubescens Sacc. Syll. x. p. 465, 1892.

Acervulae roundish, pale coloured; spores blunt at the ends, straight or slightly bent, mostly filled with guttulae. Sporophores (?) one-celled, in the mature fungus projecting like hairs.

On dead bark of *Tilia*. Coll. D. A. Boyd, West Kilbride, Ayrshire, May, 1917.

The size of the spores is not given in the original diagnosis. In Mr. Boyd's specimens they are oblong, rounded at the ends and full of small guttulae, they measure about 15 × 7μ. The projecting filaments are not present.

AMPHICHAETA Mac Alp. Proc. Linn Soc. N. S. Wales 1904 p. 118; Sacc. Syll xviii. p. 486, 1906.

Acervulae subcutaneous, often erumpent, disciform or pulvinate. Conidia elongate, 2-pluriseptate, become partly coloured, 1-ciliate, at each end.

A. EUROPAEA Grove in Journ. Bot. lx. p. 136, 1917.

On thick dead shoots of *Vitis vinifera*, King's Cliffe, (Berkeley, 1851). In Kew herbarium.

Leptostromella pteridina (Sacc. et Roum. Mich. ii. p. 353, 1880-82); Sacc. Syll. iii. p. 660, 1884.

Pycnidia elongate, applanate, 1-1.5mm. long, immersed then subsuperficial, not sulcate; spores filiform, acicular, colourless, 5-6-septate, 80μ × 1.5μ.

On stems of *Pteris aquilina*. West Kilbride, Ayrshire, May, 1917. Comm. D. A. Boyd.

In Mr. Boyd's specimen the spores measure about 50μ to 75μ. None have been seen up to 80μ in length, and usually they are between 50 and 60μ. There seems however no reason to doubt that the specific determination is justified.

Libertella blepharis A. L. Sm.

Described in Trans. i. p. 155, 1900 on branches of *Prunus cerasus* and *Pyrus malus,* collected by D. A. Boyd in Ayrshire. It has been again found in Ayrshire at Stevenston, also by Mr. Boyd, on branches of *Crataegus oxyacantha.* It is characterized by the strongly falcate spores measuring up to 40μ in length.

Amerosporium patellarioides n. sp.

Pycnidiis superficialibus, subsphaericis vel ellipsoideis ca.7mm. long. tandem siccis collabescendo patellaribus, atro-brunneis, sparse pilosis; pilis erectis, septatis, brunneis 250μ × 10μ, Apice obtusis et subhyalinis, sporophoris gracilibus, ramosis; sporis cylindraceo-fusiformibus 8-10μ × 2μ.

In foliis dejectis *Rosae caninae.* Coll. D. A. Boyd, Kilwinning, Ayrshire, Jan., 1916.

The peridium is composed of rusty-brown, strong-walled cells. The whole pycnidium is swollen when moist, and collapses to a concave form when dry. It is possible that the above may be identical with *Amerosporium chaetostroma* (Berk. and Br.) Sacc. But there is no specimen of this fungus either in the herbarium of the British Museum or at Kew. Miss Wakefield has kindly given dimensions from *A. macrotrichum* (Berk. and Br.):—hairs varying from 230μ to 810μ × 12-15μ and spores lunate-fusiform, 5-6μ × 5μ.

HYPHOMYCETES.

Ramularia umbrosa n. sp.

Maculis purpureo-brunneis, effusis, magnam partem foliorum necantibus; caespitulis minutis, gregariis, epiphyllis; conidiophoris e base brunneolo parenchymatico ortis, dense fasciculatis, simplicibus, parum flexuosis, saepe subgeniculatis et dentatis, sursum attenuatis vel obtusis; ca. 25μ × 4μ; conidiis cylindraceo-ellipsoideis, interdum catenulatis, simplicibus, hyalinis, 10-16μ × 2μ.

In foliis vivis *Saxifragae umbrosae.* D. A. Boyd, West Kilbride, Ayrshire, May, 1917. A hypophyllous species *R. Saxifragae* Syd. has been described, which differs in the characters of the fertile tufts as well as in their position on the leaf.

Zygodesmus fulvus Sacc. Mich. II. p. 147, 1880-82.

Recorded by W. B. Grove in Journ. Bot. lv. p. 136, 1917, from Lyndhurst, Hants, collected by Dr. J. S. Bayliss Elliott.

Stemphylium macrosporoideum Sacc. Syll. iv. p. 519, 1886.

Epochnium macrosporoideum B. & Br. Not. Brit. Fig. n. 131 (t. 8, fig. 14) in Ann. Mag. Nat. Hist. Ser. 1. I., p. 263, 1838.

On Plaster of Paris disc on which *Saccharomyces* had been grown for sporulation; W. J. Hodgetts. Recorded by W. B. Grove in Journ. Bot. lv. p. 136 (i. fig.), 1917.

Stysanus microsporus Sacc. Mich. I. p. 274 (1878).

Gregarious, grey then brown. Stem thread-like, formed of brown almost continuous hyphæ, the head clavate; conidia in chains almost globose, hyaline (purplish-brown in the mass), 2-4μ long, 2-2.5μ thick. On decaying wood, or herbaceous stems, &c.

Collected by W. N. Cheesman on decaying wood at Selby, Yorkshire, Sept., 1917.

There is in the specimen a rich production of conidia, so that the heads (in the protected specimen) had become overweighted, split up and fallen apart in tripartite lobes. The stems are very slender and black, the heads a delicate purplish brown.

Volutella longepila n. sp.

Sporodochiis subsessilis, hemisphericis, albidis, parvis, 250μ-350μ latis, margine ciliatis; setis longis, hyalinis, cylindraceis, levibus, septatis, apice obtusis vel sensim attenuatis, usque ad 650μ longis, 8μ latis; conidiophoris dense congestis, gracilibus ca. 40μ ad 70μ longis; conidiis hyalinis, ellipsoideo-cylindraceis, 5-7μ × 1-2μ.

Hab. In ramulis dejectis *Ulicis europaei,* Ardrossan, Ayrshire. Collected by D. A. Boyd, Feb., 1913.

The species is characterized by the long smooth cilia and by the small spores.

UREDINEAE.

Puccinia longissima Schröt in Cohn's Beitr. iii. p. 70, 1883; Grove in Journ. Bot. lv. pp. 135-6 (1 fig.), 1917.

On *Koeleria cristata,* near Aberdeen.

Hitherto put doubtfully under *P. paliformis* Fuck.

HYPHOMYCETES AND THE ROTTING OF TIMBER.

By A. Lorrain Smith, F.L.S.

Specimens of decaying timber from houses in Surrey and Suffolk have been sent to me recently to be examined. In both houses there was an outbreak of dry-rot on walls and floors, but there were also beams in other parts of the buildings attacked by fungi that had no relation to *Merulius lacrymans*.

In the Surrey house, a modern building, the end of a beam was affected, and small portions were submitted for examination. One of which, over an inch in length, was marked by dark speckles. Under the microscope a strong brown mycelium was found invading the woody tissues. The medullary rays were partially destroyed: in them the mycelium was more luxurious and had formed dark-brown chlamydospores which gave the speckled effect to the specimen. On the extreme end of the beam there was a confused tuft of dark mycelium and small round spores also very dark in colour but the material was too old and too formless for exact identification. A thin section of the affected wood was placed in a culture of water with a slight admixture of glucose-agar. In a few days there grew out a tuft of colourless mycelium from which developed conidiophores, these being the ultimate branchlets of the hyphæ. From these tips and from side branchlet chains of small subglobose spores arose: they were colourless at first but gradually changed to brown. They measured the same as those found on the end of the beam, 3-4μ in diam. or 3-4$\mu \times 3\mu$; the mycelium did not become brown in the open culture; there seems no doubt however that it is continuous with the brown hyphæ within the wood. The fungus seems to be identical with *Torula abbreviata* Corda, which grows on wood etc. and bears short chains. I am not sure of its identity with the superficial black tufts.

The wood so far shewed little injury as it was quite firm, but in time trouble might arise.

The diseased timber from an old house in Suffolk (other

than that affected by dry-rot) formed part of a beam built into the wall behind a shutter. It was very dark brown in colour and extremely friable and dry, breaking easily into debris. There were blacked portions in channels and patches suggesting the presence of insects but no trace of these could be found, the fragments in question were minute portions of disintegrated woody tissue traversed and tangled by brown mycelium. The mycelium travelled between the woody cells and did not specially affect the medullary rays. Inside one of the split portions of the wood I was fortunate enough to find the fructifications of a Hyphomycete, the conidiophore of which bore a striking resemblance to the mycelium that was found traversing the wood. It was a *Haplographium* with a very dark, long, stout stalk, penicillioid branching at the tips, and bearing chains of innumerable minute colourless spores massed into heads. One of these measured about 70μ across, another of ovoid form about 200$\mu \times$ 100μ. The spores are extremely small, subglobose or ovoid, and measure about 1μ in diam. or 2$\mu \times 1\mu$. It resembles most nearly **Haplographium finitimum* Sacc., though the spores are somewhat smaller than in that species. There were on the stalk small swellings where a previous apical head or a lateral head had been borne. Cultures on a glucose-agar medium were attempted but without success: the fungus had evidently lost viability.

There was also associated with the *Haplographium* a species of *Verticillium,* brownish in colour and with colourless or brownish spores about 2.3$\mu \times 2\mu$ probably a form of *V. tenuissimum* Corda. It evidently aided in the work of disintegration, though the *Haplographium* is the principal agent.

It is a commonplace of mycology that the abundant hyphomycetous flora of our woodlands assists in the breaking up of plant debris, and the above instances are examples of this action. The fungi were probably present on the beams when placed in position and favourable conditions of moisture, etc., encouraged their continued growth, resulting in the slow destruction of the timber.

*Trans. III., p. 36 (pl. 1, fig. 4), 1908.

SOME NEW SPECIES OF FUNGI IMPERFECTI

By Jessie S. Bayliss Elliott D.Sc. Birm. B.Sc. Lond.

During the last two years (1916-1917) I have found the following six species of Fungi Imperfecti; four of them are new, and two are new records for the British Isles. With the exception of one, which appeared in a culture in the Botanical Laboratory of the Birmingham University, all were growing on decaying wood or fallen pine cones, lying under pine trees in my garden (Tanworth-in-Arden, Warwickshire).

AEGERITA VIRIDIS Bayliss Elliott. *Sp. nov.*

Crowded, granuliform, minute, globose, 0.5 mm. diameter, deep green when fresh; conidophores profusely dichotomously branched so that they sometimes appear fasciculate instead of simple at the base; conidia formed in branching chains, globose, 4μ diameter, or frequently subglobose when part of a chain, olive and smooth, (Figs. 1, 2, 3, 4).

On rotten wood, Tanworth-in-Arden, Warwickshire.

This fungus is very abundant on rotten wood lying in damp places in the district of Tanworth-in-Arden throughout the year. It is distinguished from *A. virens* Carm. by the crowded habit and the very much smaller conidia.

Latin diagnosis. Conferta, granuliformis, minuta, globosa, 0.5 mm. diametro, recens saturate viridis; hyphis fertilibus profuse dichotomis ut interdum basi quasi fasculatis; conidiis in catenas ramosas digestis, globosis vel subglobosis, olivaceis, levibus, 4μ diam. Hab. in ligno putrido (Figs. 1-4).

CLONOSTACHYS DICHOTOMA Bayliss Elliott. *Sp. n.*

Forming effused tawny patches; sterile hyphæ septate, broad, 10μ diameter, pale ochraceous; fertile hyphæ lax, very much branched, repeatedly dichotomous or sometimes trifurcate, colour tawny; branches ascending, 2.5μ diameter, with few septa, tapering to an elongated thread 20-30μ long which forms the axis of a compact spike of closely crowded conidia; conidia globose, 2μ colourless, (Figs. 5. 6. 7).

On decaying wood. Tanworth-in-Arden.

It is difficult to decide in which genus this fungus should be placed—*Clonostachys* or *Sporotrichum*; but I have assigned it to *Clonostachys* because of the conidia occuring in closely crowded spikes such as are seen in *C. araucaria Cda.*; nevertheless in the method of branching of the fertile hyphæ the genus *Sporotrichum* is more in agreement.

Latin diagnosis. Plagas effusas fulvas efformans; hyphis sterilibus septatis, 10μ diam., pallide ochraceis, fertilibus laxis, ramosissimis, repetite dichotomis, subinde trichotomis, fulvis, ramulis adscendentibus, 2.5μ diam., septis paucis instructis in filum, 20-30μ longum attenuatum conidiis dense constipatis spicæ ad instar abeuntibus; conidiis globosis, achrois, 2μ diam.

Hab. in ligno putrescente. (Figs. 5-7)

DENDRODOCHIUM ALBUM Bayliss Elliott. Sp. n.

Sporodochia minute, erumpent, scattered, circular, slightly depressed in centre, 100-200μ diameter; conidiophores simple with trifurcate apex, 22-25 × 1.5μ septate; conidia smooth, spherical, white 2.5μ diameter, (Figs. 8, 9, 10, 11).

On fallen pine cones, December 1916; Nov. 1917.

Tanworth-in-Arden, Warwickshire. (Figs. 8-11).

The conidia are evidently abstricted from the trifurcate conidiophores in a basipetal manner, and become immediately detached since no chains of conidia are to be seen; they are produced in enormous quantities and in a damp atmosphere a slowly growing column-like mass is formed on the top of the sporodochium which ultimately topples over, and the conidia on coming in contact with water are very rapidly dispersed.

Latin diagnosis. Sporodochiis minutis, sparsis, erumpentibus, orbicularibus, centro depressulis, 100-200μ diam.; conidiophoris simplicibus, apice trifurcatis, septatis, 22-25 × 1.5μ conidiis levibus, sphaericis, albis, 2.5μ diam.

Hab. in conis *Pini silvestris* delapsis.

TRICHOCREA March in Camp, copr. VI. p. 14. Sacc. Syll. X, p. 410.

Pycnidia superficial, ovoid, at first closed, then wide open, almost discoid; texture parenchymatous, rather soft and waxy, pale coloured. Spores very numerous, narrow cylindrical, 1-septate, hyaline; sporophores elongated, filiform, densely fasciculate, branched above.

Trichocrea oödes Bayliss Elliott. *Sp. n.*

Pycnidium superficial, gregarious, lemon or egg-shaped, 130-190μ × 180-200μ, stalk, 50-100μ long, shining, whitish; excipulum consisting of very narrow interwoven septate hyphæ; at first closed, then open, margin fringed with converging hairs. Pycnospores elongate, linear, some slightly bent and thicker in the middle, 30-60 × 0.5μ aseptate and pluriguttulate, colourless, situated on branched sporophores, which rise in dense clusters from the base of the pycnidium: the pycnidia turn black with age, (Figs. 12, 13, 14, 15, 16).

On a fallen cone of *Pinus sylvestris*. Tanworth-in-Arden, Warwickshire.

I have included this is the genus Trichocrea although it does not quite agree, seeing that the excipulum is not parenchymatous but of interwoven hyphæ; also the spores are continuous, not septate, but they may become so since they are pluriguttulate: but as the genus *Trichocrea* hitherto only contains one species, *Tr. stenospora* March. recorded for Belgium, which has some points of resemblance with this species, it seems better to do this than burden the classification with another genus.

The spores germinate readily in 24 hours and by means of connecting hyphæ often anastomose with one another.

A group of pycnidia looks very like a cluster of insect's eggs, so much so that although I had frequently seen groups of them I had not troubled to examine them, thinking they were insect's eggs.

The hyphæ forming the excipulum, the long branched conidiophores, the attenuated pycnospores are all so nearly of the same narrow width that a crushed pycnidium appears little more than a mass of pycnospores unless very carefully examined.

Latin diagnosis. Pycnidiis gregariis, superficialibus, ovatis vel limoniiformibus, 150-190 × 180-200 μ, pedicello 50-100μ longo præditis, nitidis, albidis, senio nigrescentibus, initio clausis, dein apertis, excipulo hyphis angustissimis septatis intertextis constante, margine pilis convergentibus ciliato. Sporulis elongatis, linearibus, raro flexis medioque crassioribus, 30-60 × 0.5 μ, eseptatis, pluriguttulatis, achrois, sporophoris e basi pycnidii oriundis dense fasciculatis suffultis.

Hab. in cono delapso *Pini silvestris,* (Figs 12-16).

Haplographium fuscipes (Preuss) Sacc. Syll. iv. 307.

Forming delicate inconspicuous cinder-grey patches; mycelium creeping, dark brown, fertile hyphæ erect, 110 × 3μ, simple, occasionally branched, septate, dark brown below, becoming paler and colourless above, where each divides into two or sometimes three main colourless branches which again branch freely and bear numerous short branches, to which are attached conidia in short chains, which may also branch; these branches and conidial chains form a rather lax globose or sub-globose head; conidia hyaline, globose, 1.5μ diameter, (Figs. 17, 18).

On fallen cones of *Pinus sylvestris*, Tanworth-in-Arden, Warwickshire.

This agrees with Saccardo's description of *H. fuscipes*, found on the fallen leaves of *P. sylvestris* (Germany).

Sterigmatocystis phæocephala Sacc. (Fungi Ital. t. 908).

Creeping hyphæ large, colourless; fertile hyphæ erect, unbranched, with pale brownish contents, transparent and tinged brown when empty, aseptate; apex inflated, 46μ diameter, conidiophores 15-17μ long with 3 or 4 sterigmata 10-14μ long; conidia in chains, globose, minutely warted, brown, 2.5-3.5μ diameter, (Figs. 19, 20, 21).

On agar culture medium infected for bacteria in a Petri dish in the Botanical Laboratory, University of Birmingham.

This fungus agrees except in a few minor details with the description of *S. phæocephala* Sacc. previously recorded for Algeria, Italy, Germany, Argentine, and Madras as occuring on decaying roots, etc.

In the original description the fertile hyphæ are described as "Sub apice globoso inflato strangulatis," but only a very slight trace of strangulation is to be seen in the figure appended and with this my specimen almost agrees.

Also although the conidia are said to be subglobose they are figured as I find them—globose.

The fertile hyphæ with their heads of conidia are quite white in mass for several days before they assume the brown colour, hence zoning is a very conspicuous feature in cultures.

The shade of brown varied very much with the amount of light to which the fungus was exposed. Cultures grown in bright light were a chocolate brown and afforded a marked contrast to the fuscous brown colouration of those grown in darkness or dim light. Cultures under varying conditions

of temperature, or of acidity or alkalinity of medium produced no corresponding change of colour.

The fungus bears some resemblance to *Aspergillus nigricans* described by Cooke, 1885, as occurring "in the meatus auditorius of the human ear," but the conidia are smaller and the colour does not approach black; moreover it is a *Sterigmatocystis* not an *Aspergillus*.

In conclusion, I wish to express my indebtedness to Mr. W. B. Grove, M.A., for helpful criticism and for the Latin diagnoses, and to Professor West for the loan of books of reference, and also to Miss Lorrain Smith for her kindness in consulting books of reference inaccessible to me.

DESCRIPTION OF PLATE.

Fig.

1. *Ægerita viridis*. Groups of sporodochia showing the crowded habit, × 10
2. Conidiophore and dense mass of conidia, × 80.
3. Conidia forming branching chains, × 600.
4. Conidia, from a young sporodochium × 600.
5. *Clonostachys dichotoma*. Small portion of a much branched conidiophore, × 80.
6. Branch of a conidiophore with conidia arranged in the form of a spike, × 600.
7. Sterile hyphæ, × 600.
8. *Dendrodochium album*. Group of pycnidia, each pycnidium surmounted by a mass of pycnospores, × 50.
9. Pycnidium seen to be erumpent × 600.
10. Pycnospores, × 600.
11. Trifurcate conidiophores, × 600.
12. *Trichocrea oödes*. A group of pycnidia, × 40.
    a. Young pycnidia.
    b. Mature pycnidium with mass of pycnospores just appearing through the ostiole.
    c. Immature pycnidium whose pycnospores have been pressed out.
13. Branched conidiophores, × 600.
14. A mass of branched conidiophores.
15. Pycnospores which are very long and attenuated.
16. Germinating pycnospores which are connected by anastomosing hyphæ, × 600.
17. *Haplographium fuscipes*. Group of conidiophores × 92.
18. Conidiophores showing branching chains of conidia, × 600.

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Fig.
19. *Sterigmatocystis phæocephala.* Group of fertile hyphæ, × 120.
20. Inflated apex of fertile hyphæ with conidiophores bearing 3 or 4 sterigmata, × 350.
21. Conidia, some in chains, and some still attached to sterigmata × 600.

NEW OR RARE BRITISH FUNGI.

With Plate II.

By Carleton Rea, B.C.L., M.A., etc.

LEPIOTA FULVELLA Rea, v. t. II., fig. 2.

Pileus 3-5 cm. latus, *fulvellus,* carnosulus, margine tenuis, e convexo-campanulato expanso-subumbonatus, *squamulis adpressis, saturatioribus arcte vestitus.* Stipes 3-6 cm. longus, 3-6 mm. crassus, pileo concolor, aequalis, vel deorsum attenuatus, fistulosus, laevis; annulus albidus, inferus, fugax. Caro aquosa, albida, inodora et insapora. Lamellae 4-6 mm. latae, e pallido ochraceae, postice rotundato liberae, confertae. Sporae hyalinae, angulato-oblongatae, basi truncatae, apice acutae, 9-10 × 3.5-4μ. ut plurimum 1-2-guttulatae; basidia clavata, 4-sterigmatica, cystidia subglobosa vel pyriformia, 14-18 × 8-12μ. Ad terram nudam in nemoribus frondosis, Plowden, Salop, 25-ix.-1917.

Distinguished in the Clypeolariae section of Lepiotae by its tawny colour, adpressedly squamulose pileus, smooth stem, and the oblong spores, truncate at the base and acute or acutely angular at the apex.

LEPIOTA ROSEA Rea, v. t. II., fig. 1.

Pileus 2-3.5 cm. latus, *laete roseus,* carnosulus, margine tenuis, e convexo expansus, *granulis globosis dense obsitus.* Stipes 5-6 cm. longus, 3-5 mm. crassus, albidus, dein pileo concolor, aequalis, fistulosus, laevis; annulus pileo concolor, angustus, medius, mox evanidus. Caro albida *dein rubescens,*

inodora et insapora. Lamellae 4-5 mm. latae, ex albido subochraceae, postice rotundato liberae, confertae. Sporae hyalinae, ellipticae, 5 × 3μ, 1-guttulatae; basidia clavata, 4-sterigmatica; cystidia in speciminibus examinatis nulla. Ad terram nudam in nemoribus humosis et frondosis, Caughley, Salop, 29-ix.-1917.

Easily known amongst the Granulosae group of Lepiotae by its deep rose colour, granular pileus, smooth stem, and the flesh becoming reddish. The fugacious globose cells on the pileus measure 45-50μ in diameter.

Boletus lacteus Lév. Lév. An. sc. n. (1848), 124. Quél. Fl. Myc., 425.

Pileus 10-15 cm. wide, *pure white,* convex, gibbous, minutely tomentose. Stem 9-12 cm. long, 4-6 cm. thick, *pure white, incrassated at the base,* firm, *velvety,* stuffed with a spongy pith and cavernous, at length hollowed out. Tubes *white,* free, short; orifice of pores *white,* minute, round or angular. Flesh white, *becoming deep indigo blue on exposure to the air,* spongy, thick at the disc, thin at the margin of the pileus. Spores white, pip-shaped, 8-9 × 4-5μ, 3-5-guttulate.

On the ground, under oak and nut bushes, Shrawley Wood, 12th August, 1917.

Resembling *Boletus cyanescens* in the flesh, turning a deep indigo blue color when sectioned, but differing in the pure white colour of the pileus and stem and the thickened base of the stem.

Clavaria cinerea (Bull.) Fr. var. *gracilis* Rea, v. t. II., fig. 4.

Varietas a typo recedens, *statura majore, trunco tenui, ramis ramulisque gracilibus.*

This variety has a facies quite distinct from the type. The trunk is long and slender and divides up into numerous tapering branches and branchlets. The spores are white, subglobose, with a basal apiculus, 9 × 8μ, with a large central gutta.

On bare soil in woods. Caughley, Salop, and Shrawley, Worcestershire.

Clavaria rugosa (Bull.) Fr. var. *fuliginea* Fr. Fr. Hym. Eur. 669.

Differs from the type in the dark, sooty colour of the clubs and flesh.

On the ground, Caughley Wood, Salop, 29th September, 1917.

4. Clavaria [illegible] Rea

5. Clavaria chionea (Pers.) Quel.

Ashford & Son & West, Newman, Ltd

Clavaria chionea (Pers.) Quél. Pers. Myc. Eur. I., 167. Quél. Fl. Myc. 465. See pl. II., fig. 5.

Snow white. Trunk thin, 2-3 cm. long, 2-3 mm. thick, tough, very much branched, branches long, thin, unequal, pointed. Spores pale yellow in the mass, hyaline under the microscope, subglobose, with a basal apiculus 4-5 × 4μ, with a large central gutta.

On bare soil, Caughley Wood, Salop, 29th September, 1917.

Geaster triplex Jungh. Jungh. nov. gen. et sp. plant, fl. Jav. 287. Hollós Gasteromyc. Ungarns. 73. Lloyd, The Geastrae 25.

A specimen of this uncommon Geaster was sent to me by Miss Gulielma Lister, on the 14th October, 1917, from Prestwood, near Wycombe, Bucks. Worthington G. Smith includes it in his list of British Basidiomycetes at p. 71. It is characterized by the outside of the exoperidium cracking up into areolae, the very thick, fleshy collenchyma-like inner layer of the exoperidium, which makes the exoperidium on section appear very like that of a Scleroderma, and the elongate columella reaching to the centre of the endoperidium. Spores light brown, globose, 4-5μ, warted, capillitium threads light brown, 6-7μ in diameter.

Cyathipodia villosa (Hedw.) Boud. Hedwig Musc. frond. II., 54. Sacc. Syll. viii., 150. Boud. Icon. Myc. iv., 128, t. 240.

Ascophore stipitate, cup-shaped, ·5-2 cm. wide; margin thin, slightly sinuate; hymenium brown; externally fuliginous grey, villosely squamulose, stem 1-3 cm. high, 2-3 mm. thick, concolorous with the exterior of the cup, paler and whitish at the slightly bulbous base, villose. Asci cylindrical, gradually attenuated to the base, 210-235 × 15-18μ, 8-spored. Spores elliptical, 16-18 × 12-13μ, with a large central gutta and accompanied or not with more or less numerous guttulae. Paraphyses linear, slightly thickened at the apex, 220-240 × 5-7μ yellowish.

On the ground, Weybridge, Surrey, 7th October, 1917, Mr. A. A. Pearson.

Humaria tetraspora (Fuck.) Boud. Fuck. Sym. Myc. 317. Boud. in Bull. Soc. Myc. Fr. I., 106. Rabenh. Krypt. Fl. III., 937. Boud. Icon. Myc. iv., 222, t. 393. See pl. II., fig. 3.

Ascophores 1-4 mm. wide, scattered, sessile, hemispherical; margin distinct, crenulate; hymenium bright orange, plane,

then convex, externally paler and covered with a delicate white tomentum. Flesh concolorous. Asci cylindrical, attenuated at the base, 170-180 × 12-14μ, *4-spored,* not turning blue with iodine. Spores fusiform, 25-30 × 10-12μ, obtuse, smooth, hyaline, 2-4-guttulate. Paraphyses flexuose, simple, or branched, septate, gradually attenuated downwards, 180-185 × 2-4μ, filled with reddish granules and turning green with iodine.

Amongst moss, near Perth, 14th September, 1917, Mr. J. Menzies. Mr. Menzies also reported that he had gathered this species in company with Mr. C. McIntosh on the sandy bank of the Tay near Ballinluig in 1913.

Dermatea umbrina Cke. & Massee. Cke. & Massee in Grev. xxi., 72.

Mr. J. Menzies found a number of specimens growing on *Ulex,* near Perth, on the 1st January, 1918. Asci cylindrical, somewhat abruptly attenuated at the base, 110-120 × 12μ, 8-spored. Spores elliptical, 13-16 × 8-10μ, hyaline, becoming brownish with age, with a large central gutta. Paraphyses linear, 120-140 × 2-3μ, septate.

ANTROMYCES Fresen. Beitr. I., 37 (1850). Sacc. Syll. iv., 626.

Coremia compact, dark brown. Stem cylindrical. Heads hemispherical, somewhat waxy, consisting of compact, dichotomously branched conidiophores. Conidia at first continuous, hyaline, then 1-septate, cylindrical-fusiform, brownish, catenulate.

Antromyces copridis Fresen. Beitr. I., 37 (1850), Tab. iv., figs. 40-45. Bizzoz. Micol. Venet., 528. Boudier in Bull. Soc. Myc. France III., 152, Tab. xvi. Sacc. Syll. iv., 626, x., 698.

Mycelium pale. Coremia *Stilbella*-like, dark grey, 2-3 mm. high. Stem cylindrical, or slightly attenuated above, somewhat thickened at the base, simple, or very rarely forked, consisting of smoke-coloured, septate hyphae. Heads round, 5-7 mm. in diameter, somewhat umbilicate on the underside, composed of dichotomously branched threads. Conidia arising from the ends of the hyphae in long, dichotomously branched threads, oblong, cylindrical, 13-20 × 5 -8μ, continuous, then divided by a cross-wall, not or only slightly constricted at the septum, darker and granular inside, pale brownish.

On the inside of the case of dung of the *Copris* beetle, ex Mr. Hugh Maine per Miss A. Hibbert-Ware, 14th September, 1917.

WORTHINGTON G. SMITH AS MYCOLOGIST.

By A. Lorrain Smith, F.L.S.

Worthington George Smith, F.R.A.I., F.R.S.A. Ireland, F.L.S., the distinguished archæologist and botanist, died at Dunstable on the 27th October, 1917, at the age of eighty-two. His loss is of particular significance to mycologists. In his study of plants he possessed the unusual advantage of thorough scientific field knowledge, combined with great artistic skill in delineating the living specimens, an advantage of extreme value in dealing with such perishable plants as fungi.

Smith specialized on fungi from an early date in his career; he was one of the leading members of the mycological group of the famous Woolhope Club, which did so much to keep alive the study of mycology in this country after Berkeley's day. Our own members have seen and enjoyed the menu cards with their overflowing humour which he prepared for the annual fungus feasts at Hereford. In 1898 he was enrolled a member of the British Mycological Society and in 1903 was unanimously elected President, but his advancing years and precarious health prevented him from taking any active part in the work of the Society, and, unfortunately, he was unable to preside over the meeting at Whitby in the following year.

One of his first papers on fungi was published in the Journal of Botany II. p. 215, 1864, and gives his experience of the serious results that followed the eating of a poisonous fungus, *Agaricus fertilis* Pers. In the same Journal there was recorded, the following year, his discovery of a new British truffle, *Tuber excavatum* Vitt.; and yet another side of the subject was dealt with two years later (Op. cit. v. p. 367, 1867), in an account of the successful artificial culture of *Agaricus Loveianus* (*Volvaria Loveiana*), which grows parasitically on species of *Clitocybe*. Thereafter until nearly the end of his life, followed a long series of papers and notes (some two hundred and fifty and upwards), which appeared in the above journal, the Gardener's Chronicle, Nature, &c. These papers, as we might infer, deal with every aspect of mycology.

An economic consideration of fungi, possibly suggested from his poisoning experience, was treated in "Mushrooms and Toadstools: how to distinguish easily the differences between edible and poisonous Fungi." The book or pamphlet was published in 1867 and is finely illustrated by two

folded sheets of coloured figures representing the commonest edible and poisonous species; subsequent editions were called for in quick succession, the fourth being issued in 1879. It is now, however, out of print.

Many of the notes and papers published during these early years dealt with plant diseases due to the attacks of parasitic fungi, and in 1875 the Royal Horticultural Society shewed its appreciation of his work by awarding him the Knightian Gold Medal for his researches into the life-history of the potato disease fungus. In 1884 he issued a notable contribution to the Fungology of the British Isles:—"Diseases of Field and Garden Crops, chiefly such as are caused by Fungi." The book, as he tells us, embodies the reports of a series of addresses given at the request of the officers of the Institute of Agriculture at the British Museum, S. Kensington. Twenty years earlier, Cooke had published "Microscopic Fungi," but Smith treated the whole subject in its economic aspect: he gives in detail the life-history of the parasites, and suggests means to stay if not entirely to remedy the diseases.

Worthington Smith's systematic studies and publications were also of very great importance. The "Clavis Agaricinorum, an analytical Key to the British Agaricini, with characters of the genera and subgenera," was prepared for the Woolhope Club and published as a thin octavo volume or pamphlet in 1870. Much of it is included in his subsequent works. In 1891 he published the "Outlines of British Fungology, Supplement," thus bringing the earlier volume by Berkeley up to date. A Guide to Sowerby's Models of British Fungi in the British Museum (Natural History) was issued in 1893 and was reissued in 1908. It is a remarkably good introduction to the study of the larger fungi. The more recent Museum Guide to drawings of Field and Cultivated Mushrooms and Poisonous or Worthless Fungi often mistaken for Mushrooms" (1910), is accompanied by a large folded sheet of coloured drawings of the Mushroom in its many forms. The largest and most important of his systematic works is, however, the "Synopsis of the British Basidiomycetes," also published by the British Museum (1908). It provides a standard and reliable work on the subject, but suffers somewhat from necessary compression.

Smith's skill as a botanical artist was in constant requisition, his studies of orchids and other plants appeared from time to time in the Gardener's Chronicle between the years 1875 and 1910.* With his illustrations of Bentham's British

*For other details see Obituary notice in Gardener's Chronicle, lxii., p. 180, 1917, where also is reproduced a characteristic and life-like photograph.

Flora (in collaboration with W. H. Fitch) we are all familiar. His own publications are mostly accompanied by delightfully executed drawings. A work entitled "Mycological Illustrations" was projected by W. Wilson Saunders, the drawings in which were to have been supplied by W. G. Smith. Only one volume was issued, which contains 48 coloured plates with accompanying descriptions. The text figures in Stevenson's "Hymenomycetes Britannici" are other instances of his wonderful draughtsmanship. The unpublished drawings are no less noteworthy. A large and attractive series representing all the larger British Fungi is exhibited in the Botanical gallery of the Natural History Museum. These coloured drawings are in constant request during the Fungus season. A further extensive series of similar drawings illustrating forms and varieties is a substantial component of the valuable museum collection carefully preserved in the cryptogamic herbarium.

Smith's work was almost wholly confined to British Fungi. Only one excursion does he seem to have made into foreign fields in supplying the Section "Fungi" of Seeman's "Flora Vitiensis." Few fungi had been collected, but these include a black *Rhizomorpha* which, as a fringe, formed a much coveted article of dress in Fiji. The plant is called Wa loa in the vernacular, meaning creeper; it grows on decaying wood in swamps.

Worthington Smith had a thorough knowledge of British fungi with their many forms and varieties, and that knowledge he was always ready to share with others. No one who came in contact with him will ever forget his ready and willing assistance and his kindly, courteous personality.

RESUPINATE HYMENOMYCETES FROM THE NEIGHBOURHOOD OF WEYBRIDGE, SURREY.

By E. M. Wakefield F.L.S. and A. A. Pearson F.L.S.

All the species recorded in this paper were found during the winter months of 1917-18. They are an interesting series, including as they do six species and two genera new to the British Fungus Flora, with one species new to science.

The resupinate basidiomycetes make a very suitable study for the winter months. Very little else can be found. The fleshy agarics disappear with the first serious frost and afterwards only appear sporadically. The frost doubtless affects the resupinates also, and the specimens found in or after frosty weather are not in good fruiting condition. They also dislike too much wet. On the whole, however, they would appear to be among the hardiest members of the tribe, and this is partly explained by their protected position underneath logs and sticks resting on the ground. Frequently a sporophore would appear actually to touch the ground, but there is presumably sufficient room, due to the inequalities of the soil, for the spores to escape from this confined position by means of the air currents that pass underneath the wood.

A large number of species take part in breaking down the tissues of old logs and sticks. In the notes attached to the specific descriptions of Bourdot and Galzin, some species are designated as "lignivore," others "peu lignivore," and so on. Long experience and careful observation are necessary before the exact part played by any particular species can be judged. Certain species are well known to cause rot in worked timber, and in the woods it is easy to conclude that the common *Irpex obliquus* is an active agent in destroying old wood. Other species, however, do not allow of such ready judgments. *Protodontia uda*, for instance, was growing on damp wood in the last stage of decay. Was this decay due to the action of the fungus, or had the wood reached a spongy crumbling condition before it was attacked by the Protodontia? The answers to such questions are of considerable interest.

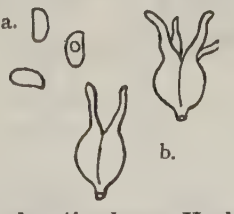
It may be of some value to give a list of the resupinates collected during three months, from the middle of November to the middle of February. They were all gathered within easy distance of Weybridge, and may therefore serve as a contribution to a Surrey list of Fungi. The resupinates do not usually form a prominent feature of such lists. In the following both the common and the rarer species are included, but many that at present seem to be rare may prove to be common when sought for.

PROTODONTIA von Hoehnel in Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Kl., Bd. CXVI, Abt. 1, 1907, p. 83.

A genus resembling Odontia in appearance, but distinguished by possessing the vertically septate basidia characteristic of the order Tremellaceae. It is analogous to the genera Tremellodon and Protohydnum, differing from the latter, which does not occur in Britain, in its thinner, less fleshy subiculum, and more slender spines.

Protodontia uda von Hoehn. in Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Kl., Bd. CXVI, Abt. 1, 1907, p. 83.

Fructification effused, indeterminate, pure white and slightly hyaline when fresh, very soft and delicate. Subiculum very thin, sometimes almost wanting. Spines slender, acute, up to 400μ long and 100-150μ wide, at the base, subgelatinous and slightly hyaline, becoming yellowish and collapsing as they dry. When quite dry the subiculum appears white and mealy, and the spines subtranslucent, yellowish, thread-like and curved.



Protodontia uda von Hoehnel. a, Spores; b, Two basidia × 850.

Basidia globose, sunken, vertically septate, 7-8μ in diameter, with 2-4 sterigmata 8-10 × 1-5μ. Spores hyaline, elliptical, one side flattened, 6-8 (-9) × 3-4μ. Hyphæ very fine and closely adherent, hence scarcely to be distinguished.

On very soft, rotten wood, near Effingham, A. A. Pearson, Dec. 15th, 1917.

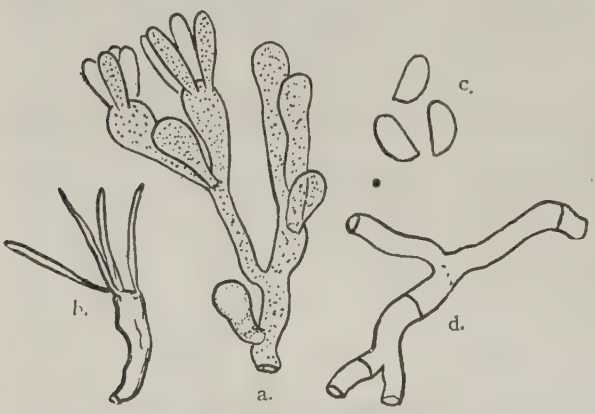
At first sight this plant would suggest a "water-logged" specimen of *Odontia farinacea*. On microscopic examination it is at once distinguished by the septate, *Tremella*-like

basidia, which, however, can only be seen in the fresh specimen, as they collapse completely on drying.

TULASNELLA TREMELLOIDES Wakef. et Pearson, sp. nov.

Sporophorum late effusum, purpureum, gelatinosum, plicato-undulatum, margine concolore. Basidia clavata, 15-18 × 6.5-7μ, 4-sterigmatica, intus granulosa; sterigmata primo oblonga, intus granulosa, 15 × 3-3.5μ, demum collapsa, ad 20μ longa. Sporae ellipsoideae, uno latere depressae, basi lateraliter apiculatae, 8-10 × 4.5-5 (-5.5)μ, hyalinae. Hyphæ subhymeniales 6-8μ, basales 4μ, pallide purpureae. *Hab.* On pine needles covering a nest of *Formica rufa*, L., at the foot of a stump, extending for about a square foot, Weybridge, A. A. Pearson, Nov., 1917.

This fine plant differs from most other species of Tulasnella in the thick gelatinous consistency. When fresh it bears a strong resemblance both in colour and habit to some forms of the conidial stage of *Coryne sarcoides*. *T. fusco-violacea* Bres. is described as being gelatinous when fresh, but that species differs from the present in its longer spores, obovate sterigmata, and in drying lilac. The present species becomes blackish and horny as it dries and collapses to a thin film. It made only a fleeting appearance; the cold wind and a touch of frost shrivelled it up and turned it black.



Tulasnella tremelloides Wakef. et Pearson.
a, Group of basidia of varying ages; b, Old basidium from which spores have been discharged; c, Spores; d, Basal hypha × 850.

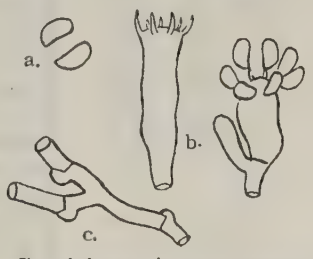
Corticium laeve Pers., *roseo-cremeum* Bres.

Corticium Galzini Bourd. et Galz. This species has hitherto

been recorded on conifers. The Weybridge specimen is noteworthy for occurring on birch bark.

Corticium niveo-cremeum von Hoehn. et Litsch. Oesterr. Corticieen, in Wiener Festschrift, 1908, p. 65. and in Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Kl., Bd. CXVII, 1908, p. 1117.

Effused, indeterminate, very thin, greyish white to cream, closely adherent to the substratum. Hymenium when fresh waxy and slightly granular in places, when dry very minutely and abundantly cracked, giving a characteristic appearance as seen under the lens, the cracks being bridged by numerous fine byssoid strands of the subiculum. Basidia very abundant, more or less clavate, but rather abruptly broader and truncate above, with 4-6-8 (frequently 8) sterigmata, 15-35 × 7-10μ. Spores cylindric-ellipsoid, one side flattened or slightly incurved, 6-7 × 3-3.5μ, occasional spores up to 10 × 5μ. Basal hyphae indistinct, branched, septate, with clamp-connections at the septa, 4-5μ.



Corticium niveo-cremeum v. Hoehn. & Litsch. a, Spores; b, Two basidia; c, Basal hypha × 850.

On a piece of very rotten wood under alders, Weybridge, A. A. Pearson, Jan. 12, 1918.

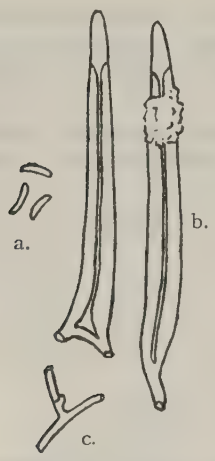
The numerous white species of Corticium are difficult of distinction in words. The present species is marked by a quite characteristic appearance when dry, and in spite of its name is hardly snow-white, but rather greyish white. The basidia and spores are further distinguishing features.

Corticium arachnoideum Berk., *botryosum* Bres., *subcoronatum* von Hoehnel & Litsch., *confluens* Fr., *confine* Bourd et Galz., *sulphureum* Pers., *echinosporum* Ellis (pink form), *comedens* Fr.

Corticium (*Gloeocystidium*) *praetermissum* (Karst.) Bres., *albostramineum* (Bres.) Wakef., *porosum* Berk. et Curt.

Peniophora glebulosa Bres. subsp. *subulata* Bourd. et Galz. in Bull. Soc. Myc. Fr. 1912, p. 385.

Under *P. glebulosa* Bourdot and Galzin distinguish a number of forms, differing in details of spores and cystidia, which they found to be remarkably constant, and designate as "espèces jordaniennes." To give them binominal names which may subsequently be taken up as the equivalent of other specific names, however, as Bourdot and Galzin have done, is to introduce unnecessary difficulties in the practical determination of species. *P. glebulosa* in the aggregate is very distinct in its peculiar type of cystidium combined with its narrow, cylindrical, more or less curved spores. The differences between the various sub-species or micro-species of Bourdot and Galzin are not at all of the same rank as the differences between *P. glebulosa* and any other usual species of Peniophora. The present form is distinguished from the type by its more acute, or subulate cystidia, and by not showing the characteristic cracking when dry from which the type species takes its name.



Peniophora glebulosa Bres. sub sp. *subulata* Bourd. & Galz. a, Spores; b, 2 Cystidia; c, Basal hypha × 550.

Peniphora pallidula Bres., *byssoidea* (Pers.) von Hoehn. et Litsch. (including the thin whitish form which has been distinguished as *P. tomentella* Bres.), *sanguinea* (Fr.) Bres., *cremea* Bres., *velutina* (DC.) Cooke, *setigera* (Fr.) Bres., *hydnoides* Cooke et Mass., *gigantea* (Fr.) Mass., *incarnata* (Pers.) Cooke, *cinerea* (Fr.) Cooke, *quercina* (Pers.) Cooke.

Hypochnus fuscus (Pers.) Karst.

Coniophora puteana Fr., *arida* Fr.

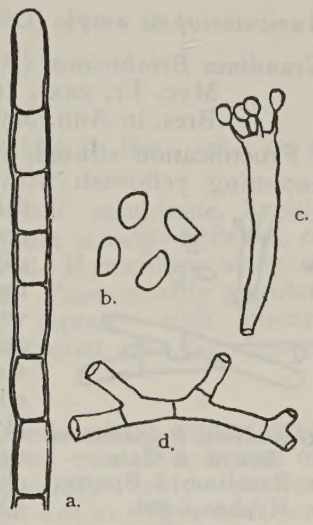
Coniophorella, Karst. Finlands Basidsv. p. 438.

This genus differs from Coniophora only in the possession of long, cylindrical cystidia. Burt in his recent monograph includes it in Coniophora.

C. olivacea (Fr.) Karst, loc. cit. p. 438.

Hypochnus olivaceus Fr. Obs. 2, p. 284; *Coniophora olivacea* Karst, Hattsv. II., p. 162, non auctt. nonnull.

Fructification thinly effused, following the inequalities of the matrix, distinctly olive when fresh, drying to a colour varying between Saccardo's Olive, Buffy citrine, and Isabella colour, the growing margin very thin and whitish. Hymenium setulose under the lens, and pulverulent with the spores. Cystidia cylindrical, brownish, paler and blunt at the apex, many septate, slightly constricted at the septa, 160-290 × 12-18μ projected about 75-100μ. Basidia elongated, tapering gradually downwards, about 40-80μ long, 7-8μ wide above, with 4 curved sterigmata 5-8μ long. Spores rather variable in shape, but more or less elliptical with one side flattened, 10-13 × 4-6 (-7)μ, yellow-brown. Basal hyphae branched, frequently sepate, with clamp-connections, 4-7μ in diameter, clear dark brown.



Coniophorella olivacea Karst.
a, Upper portion of cystidium; b, Spores; c, Basidium; d, Basal hypha × 550.

This was found in several places in uprooted pine stumps, which it sometimes takes possession of so completely as to cover the under side with several feet of fruiting surface. The long septate cystidia give the fresh specimens a velvety pruinose appearance, and this, together with the less fleshy texture, distinguishes it from the more common *Coniophora puteana,* which is also at times olive in colour.

This plant is the one identified with *Hypochnus olivaceus* Fr. by Bresadola, who examined the Upsala type. The specimen so labelled by Fries in the Kew Herbarium is a different species, and this appears to have been the reason for the confusion existing in this country as to the identity of *C. olivacea.* Although the name "*Coniophora olivacea*" has been included in the British lists, this appears to be the first time that the true plant with cystidia has been found. Most of the specimens existing under this name in collections are *C. puteana.*

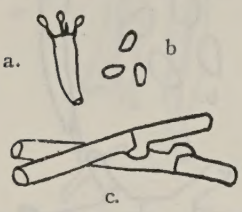
Stereum rugosum (Pers.) Fr., *spadiceum* (Pers.) Fr., *sanguinolentum* (A. S.) Fr., *hirsutum* Fr., *purpureum* (Pers.) Fr.

Hymenochaete rubiginosa (Schrad.) Lév.

Auriculariopsis ampla (Lév.) R. Maire.

Grandinia Brinkmanni (Bres.) Bourd. et Galz. in Bull. Soc. Myc. Fr. xxx., 1914, p. 252. *Odontia Brinkmanni* Bres. in Ann. Myc. I., 1903, p. 88.

Fructification effused, indeterminate, at first pure white, becoming yellowish with age, adherent. Subiculum very thin, at first pruinose, later waxy and cracked. Granules at first very fine, giving a mealy appearance, later more wartlike, or at times even developing into short spines. Basidia clavate, 15 × 4μ, with 4-6 (-8) curved sterigmata, 2-3μ long. Spores elliptical, one side flattened, 4 × 2μ. Hyphæ indistinct, soon, collapsing, up to 4μ in diameter, septate, with clamp connections. The flesh contains numerous crystals of calcium oxalate.



Grandinia Brinkmanni Bourd. & Galz.
a, Basidium; b, Spores; c, Hyphae × 850.

On birch bark, Weybridge, A. A. Pearson, Nov. 24th, 1917.

Recognisable by its finely granular appearance with scanty subiculum, spores, and abundance of crystals in the tissue.

Odontia farinacea (Pers.) Quél. = *Hydnum farinaceum* (Pers.) Fr.

Odontia bicolor (A. et S.) Bres. = *Hydnum bicolor* A. & S. = *Hydnum subtile* Fr.

This is the plant the structure of which was described in these Transactions for 1910, p. 280, under the name *Grandinia mucida*. It was always referred by Berkeley to G. *mucida*, but according to Bresadola it agrees undoubtedly with Fries' *H. subtile*, and is the same as *H. bicolor*.

The peculiar microscopic characters have also been pointed out by von Hohnel, in an article which was overlooked at the time the 1910 note was written.*

*Fragmente zür Mykol. I., in Sitzber. k. Akad. Wiss. Wien, Math.-naturw. Kl., Bd. CXI., Abt. 1, 1902, p. 1008.

Caldesiella ferruginosa Sacc.

Merulius serpens Fr. *lacrymans* (Wulf.) Fr.

Phlebia merismoides Fr.

Irpex obliquus (Schrad.) Fr.

Poria sanguinolenta (A. et S.) Fr.

Poria sericeo-mollis Romell in Arkiv f. Bot., xi., 1912, No. 3, p. 22.

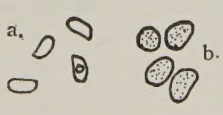
Fructification very soft, white, thick, resupinate, loosely adherent, margin often separating, but scarcely reflexed, or in the dry state sometimes incurved. Hymenium white or at length somewhat cream to pallid. Pores usually angular, variable in diameter. Hyphae septate, with clamp-connections, 2-4μ wide. Basidia 4-spored, 20 × 5μ. Spores ellipsoid, 4-6 × 2-3μ.

On rotten coniferous wood.

The above is Romell's description, which agrees very well with a plant found several times near Weybridge on pine wood and bark, and apparently fairly common there. It is rather thick and spongy, but so fragile and hard to gather in good condition that although it must have been seen repeatedly it has probably been put aside as unnameable.

Romell adds, "Some specimens which seem to belong to this species are partly or totally reduced into a floccose-pulveraceous state of sulphurous or pallid colour, which contains abundant subglobose or ellipsoidal, apparently asperulate, 1-guttulate chlamydospores of 5-7·5 × 4-5μ, not unlike those of *Ptychogaster albus*, though more hyaline."

This conidial stage is also very evident in the Weybridge specimens. Sometimes the conidia occur only at the margin, at other times the whole fungus appears to be a pale yellow powdery mass of conidia, and the true basidiospores cannot be found. The conidia are smooth, not asperulate, but have granular contents, which give a rough appearance.



Poria sericeo-mollis Romell **a, Basidiospores; b, Conidia × 850.**

Polyporus amorphus Fr., *caesius* (Schrad.) Fr., *fragilis* Fr., all in the resupinate state.

Fomes ferruginosus (Fr.) Mass.

Published 17th August, 1918.